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AGRICULTURAL EXPERIMENT STATION.

BULLETIN No. 1.

JULY, 1883.

The State Agricultural Experiment Station at the Massachusetts Agricultural College in Amherst, Mass., was established by an act of the Legislature approved on the 12th of May, 1882. The management of the Station is vested in a "Board of Control," which consists of the governor of the state, as president, ex-officio; two members elected by the state board of agriculture; two members from the board of trustees of the Massachusetts Agricultural College; one from the Massachusetts Society for promoting agriculture, and the president of the Massachusetts Agricultural College. (See Chap. 212, Laws and Resolves passed by the Legislature in 1882.) The members of the Board, at their first meeting in July, elected O. B. Hadwen secretary, and Theodore Lyman treasurer. No farther action was taken on account of the lateness of the season, until the following November when a director, a chemist and all necessary assistants, as provided by law, were appointed. The former entered upon his duties on the 15th of November, 1882, the latter on the 1st of January, 1883. By resolution of the Board its members are delegated to visit alternately every month the Station; and the director is instructed to report its condition and its wants at the bi-monthly meeting of the board.

The first report of the director was presented to the board at its annual business meeting at the office of the secretary of the State Board of Agriculture, January 30th, 1883. It contained principally a short outline of a series of experiments proposed for the consideration of the Board as the basis of the first year's work of the Station, besides a detailed statement concerning the chemical work carried on since its establishment. The essential contents of the report are published in the annual report of the secretary of the State Board of Agriculture for 1882. The college buildings selected by the Board

448505

for the use of the Station have been repaired under the special direction of Mr. Hadwen, and they are now ready for occupation. The barn and the stables for feeding experiments have been re-fitted under the immediate supervision of Prof. Miles, who has also directed the necessary underdraining of fields and buildings for experiments. Prof. Maynard has carried out the desired enlargement of experiments in fruit culture and in the cultivation of new forage crops; he has also paid much attention to the investigation of suitable means for the destruction of injurious insects. Most of the experiments assigned to the Station for the present year are fairly under way, and the remainder will be attended to in due time.

At the May meeting of the Board it was voted to authorize the director to publish from time to time in form of bulletins, such results of the work carried on by the Station as in his judgment may prove of immediate benefit to the farmers of the state; and also to make known to them to what extent and in what direction the Station in its present condition can render them assistance in their every-day's agricultural pursuit. As the character of many experiments carried on in their earlier stage of progress renders a detailed discussion quite unprofitable, it seems but natural that the bulletins for sometime hence will contain mainly the results of chemical analyses of fertilizing material, fodder articles, and such other substances as are specified in the legislative Act above referred to. For the sake of completeness, concerning the record of the chemical work of the Station, the chemical analyses previously reported will be reprinted in a proper connection with later work of a similar character.

The bulletins of the Station will be hereafter issued every month as long as the material on hand renders that course advisable. They will be sent to the agricultural press and the various agricultural societies of the state, and also to all parties inside or outside of the latter who will furnish their address to the office of the Station. It is hoped that all who are connected with the publication of agricultural topics will send in return their publications to the latter.

Arrangements have been of late perfected which enable the chemical department of the institution to attend more satisfactorily to the examination of objects of general interest to the farming community. The requests for the analyses of substances coming through officers of agricultural societies or clubs within the state, will receive hereafter first and prompt attention; and in the order as the applications for an examination arrive at the office of the Station. The material for the analysis is to be sent on, transportation prepaid; the results will be returned without charge for the work carried out. Applications for analyses of substances sent on by private parties will receive careful consideration whenever the results promise to be of a more general interest, and as far as the existing special resources admit. The limited financial means of the Station necessitate, however, in the latter case a moderate charge for the services rendered, to cover expenses. For obvious reasons no work can be carried on at the Station of which the results are not at its disposal for publication if deemed advisable in the interest of the citizens of the state. By consent of the secretary of the State Board of Agriculture the analyses of commercial fertilizers collected by the state inspector will be published hereafter in the bulletins in advance of the annual report. All parcels and communications sent to the Experiment Station must have express and postal charges prepaid to receive attention.

July, *1883*. C. A. GOESSMANN,

DIRECTOR

FODDER ANALYSES.

1. WHEAT BRAN.

Collected of Chas. Parsons, Northampton, Mass.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.
Moisture at 100° C.,	13.70	274.		
Dry Matter,	86.30			
	100.00			
Analysis of Dry Matter.				
Crude Ash,	5.83	116.6		
" Cellulose,	8.05	161.	32.	20
" Fat,	2.51	50.2	40.2	80
" Protein, (nitrog's matter)	16.88	337.6	297.1	88
Non-nitrogenous extract matter,	53.03	1060.6	848.48	80
	86.30	2000.0	1217.78	

The above stated rate of digestibility of the various constituents of wheat bran was ascertained by feeding the dry material to steers.

A detailed discussion of the various constituents,—stated in the chemical analysis of any article of fodder,—may be found in the 27th Annual Report of the secretary of the Mass. State Board of Agriculture, pages 235—7.

2. RYE BRAN.

Collected of Charles Parsons, Northampton, Mass.

	Percentage Constituents.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.
Moisture at 100° C.,	13.70	274.		
Dry Matter,	86.30			
	100.00			
Analysis of Dry Matter.				
Crude Ash,	4.46	89.2		
" Cellulose,	3.92	78.4	7.06	9.
" Fat,	1.79	35.8	20.60	57.5
" Protein, (nitrog's matter)	16.38	327.6	216.20	66.
Non-nitrogenous extract matter,	59.75	1195.0	890.20	74.5
	86.30	2000.0	1134.06	

The above stated rate of digestibility of the various constituents was ascertained in feeding experiments with pigs.

3. CORN MEAL.

Collected of Charles Parsons, Northampton, Mass.

	Percentage Constituents.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.
Moisture at 100° C.,	17.04	340.8		
Dry Matter,	82.96			
	100.00			
Analysis of Dry Matter.				
Crude Ash,	1.31	26.2		
" Cellulose,	2.99	59.8	20.3	34
" Fat,	4.00	80.	60.8	76
" Protein, (nitrog's matter)	13.94	278.8	237.	85
Non-nitrogeneous extract matter	60.72	1214.4	141.54	94
	82.96	2000.0	1457.64	

ESSENTIAL MINERAL CONSTITUENTS IN 100 PARTS OF CORN MEAL.

Potassium Oxide,	0.419	per cent.
Calcium Oxide,	0.040	"
Magnesium Oxide,	0.176	"
Phosphoric Acid,	0.644	"

The above stated rate of digestibility was found in feeding experiments with pigs.

4. CORN MEAL AND COBS.

Collected of Charles Parsons, Northampton, Mass.

78.63 per cent. passed through mesh of 144 to the inch.

	Percentage constituents.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.
Moisture at 100° C.,	19.07	381.4	Not Determined.	Not Determined.
Dry Matter,	80.93			
	100.00			
Analysis of Dry Matter.				
Crude Ash,	1.30	26.		
" Cellulose,	7.91	158.2		
" Fat,	2.78	55.6		
" Protein, (nitrog's matter)	12.19	243.8		
Non-nitrogenous extract matter,	56.75	1135.		
	80.93	2000.0		

As the rate of digestibility of cobs has not yet been ascertained by actual feeding experiments no statements regarding the digestibility of the above material are given. There is but little doubt, however, that the addition of cobs to meal deserves recognition in regard to their nutritive value as well as to their beneficial mechanical influence upon the digestion of the corn meal. For analysis of corn cobs see report of the Mass. Board of Agriculture for 1879, pages 240—4.

5. HOMINY FEED.

(Chit and soft parts of the kernel of the corn.)

Collected of Mr. J. A. Sullivan, Northampton, Mass.

46.07 per cent. passed through mesh 144 to the inch.

	Percentage Composition.	Constituents (in lbs) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.
Moisture at 100° C.,	8.93	178.6	Not determined by experiment.
Dry Matter,	91.07		
	100.00		
Analysis of Dry Matter.			
Crude Ash,	1.89	37.8	
" Cellulose,	3.43	68.6	
" Fat,	4.45	89.	
" Protein, (nitrog's matter)	10.20	204.	
Non-nitrogenous extract matter,	71.10	1422.	
	91.07	2000.	

ESSENTIAL MINERAL CONSTITUENTS IN 100 PARTS HOMINY FEED.

Potassium Oxide,	0.49 per cent.
Calcium Oxide,	0.18 "
Magnesium Oxide,	0.28 "
Phosporic Acid,	0.98 "

The ratio of digestibility is probably similar to that of the corn meal.

6. GLUTEN MEAL.

Refuse from Glucose manufacture.

From Messrs. Sumner Crosby & Son, South Boston, Mass.

	Percentage Constituents.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.
Moisture at 100° C.,	8.43	168.6	Not Determined.	Not Determined.
Dry Matter,	91.57			
	100.00			
Analysis of Dry Matter.				
Crude Ash,	0.59	11.8		
" Cellulose,	3.25	65.		
" Fat,	8.01	160.2		
" Protein, (nitrog's matter)	35.00	700.		
Non-nitrogenous extract matter,	44.72	894.4		
	91.57	2000.0		

ESSENTIAL MINERAL CONSTITUENTS IN 100 PARTS OF GLUTEN MEAL.

Potassium Oxide,	0.0564
Calcium Oxide,	0.0582
Magnesium Oxide,	0.0346
Phosphoric Acid,	0.4512
Sulphuric Acid,	0.0215

The special test for Sulphuric Acid proved the absence of any objectionable amount of that substance. The rich nitrogenous character of the "Gluten meal" places it between the brans of our grains and the oil cakes, and alongside of leguminous seeds, as beans, peas, etc. Its peculiarity as compared with the above fodder articles consists in the low percentage of mineral constituents, a point which requires careful consideration in its application.

7. LINSEED CAKE.

From Indiana.

	Percentage Constituents.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent of digestibility of constituents
Moisture at 100° C.,	8.35	167.		
Dry Matter,	91.65			
	100.00			
Analysis of Dry Matter.				
Crude Ash,	6.89	137.8		
" Cellulose,	7.97	159.4	41.4	26
" Fat,	5.22	104.4	95.	91
" Protein, (nitrog's matter)	34.14	682.8	593.8	87
Non-nitrogenous extract matter,	37.43	748.6	681.	91
	91.65	2000.0	1411.2	

ESSENTIAL MINERAL CONSTITUENTS IN 100 PARTS LINSEED CAKE.

Potassium Oxide,	1.43 per cent.
Calcium Oxide,	0.64 "
Magnesium Oxide,	0.77 "
Phosphoric Acid,	1.86 "

The stated ratio of digestibility was ascertained by feeding experiments with steers.

8. COTTON SEED MEAL.

Collected of Charles Parsons, Northampton, Mass.

	Percentage Constituents.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents
Moisture at 100° C.,	9.13	182.6		
Dry Matter,	90.87			
	100.00			
Analysis of Dry Matter,				
Crude Ash,	6.92	138.4		
" Cellulose,	5.71	114.2	26.27	23
" Fat,	11.66	233.2	212.20	91
" Protein, (nitrog's matter)	42.75	855.0	632.70	74
Non-nitrogenous extract matter.	23.83	476.6	231.24	46
	90.87	2000.0	1102.41	

The above adopted ratio of digestibility is based on experiments with sheep.

9. COTTON SEED MEAL.

Sent on by E. S. Warner, Hatfield, Mass.

	Percentage Constituents.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents
Moisture at 100° C.,	7.09	141.80		
Dry Matter,	92.91			
	100.00			
Analysis of Dry Matter.				
Crude Ash,	8.50	170.00		
" Cellulose,	9.78	195.60	44.99	23
" Fat (ether abstract)	12.64	252.80	230.05	91
" Protein, (nitrog's matter)	38.69	773.80	572.61	74
Non-nitrogenous extract matter,	23.30	466.00	214.36	46
	92.91	2000.00	1062.01	

This article is of good quality, and was obtained by bolting a coarse cotton seed meal; eighty-one pounds of the above kind was obtained from one hundred pounds of the latter; the coarse portion—nineteen per cent.—has been analyzed to ascertain its fitness as a fertilizer, with the following results:

10. COARSE PORTION OF COTTON SEED MEAL FOR FERTILIZING PURPOSES.

Sent on by E. S. Warner, Hatfield, Mass.

Moisture at 100° C.,	7.09	per cent.
Organic and volatile matter,	93.465	"
Ash Constituents,	6.535	"
	100.000	
Nitrogen in organic compounds,	5.900	per cent.
Potassium Oxide,	1.797	"
Calcium Oxide,	0.263	"
Magnesium Oxide,	0.223	"
Phosphoric Acid,	2.341	"
Insoluble Matter,	1.784	"

VALUATION PER TON OF 2000 POUNDS.

118 lbs.	of Nitrogen at 18 c.,	$21.24
46.82 "	Phosphoric Acid at 6 c.,	2.69
35.94 "	Potassium Oxide, at 4¼ c.,	1.53
		$25.46

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BULLETIN No. 2.

AUGUST, 1883.

FERTILIZER ANALYSES.

The valuation of **Commercial Fertilizers** is based on the market value of their essential constituents. The market reports of New York and Boston,—aside from consultations with leading manufacturers of fertilizers, furnish the necessary information. The subsequent statements of trade values adopted in the bulletins are obtained by taking the average New York and Boston wholesale quotations of the six months preceding March 1st, 1883, and increasing them by 20 per cent. to cover expenses for storage, sales, etc. The prices stated in connection with analyses of commercial fertilizers refer therefore to their cost, per ton of 2000 lbs., on board of car or boat.

Crude Stock for the manufacture of fertilizers, and refuse materials of various descriptions, sent to the station for examination, are valued with reference to the market prices of their principal constituents, taking into consideration at the same time their general fitness for speedy action. The general physical condition of these substances enters as an important factor in their valuation. The *mechanical* condition of any fertilizing material, simple or compound, deserves the most serious consideration of farmers, when articles of a similar chemical character are offered for their choice. The degree of pulverization controls almost without exception, under similar conditions, the rate of solubility, and thus more or less rapid diffusion of the different articles of plant food throughout the soil.

TRADE VALUES FOR 1883.

	Cost per lb.
Nitrogen in nitrates - - - - -	20 cts.
" ammonia salts, - - -	26 "
" Peruvian guanos, fine steamed bone, dried and fine ground blood, meat fish, superphosphates and special manures, - - -	23 "
Phosphoric acid soluble in water, - -	11 "
" " reverted and in Peruvian guano,	8 "
" " insoluble, in fine bone, fish-guano and superphosphates.	6 "
Potash in high grade sulphate, - -	7 "
" low grade sulphate and kianite,	4¼ "
" muriate or potassium chloride, -	4¼ "

CANADA WOOD ASHES. (11—17).

11. Sent on from Sunderland, Mass.

12. Sent on from Sunderland, Mass.

13. Sent on from North Amherst, Mass.

14. Collected at the R. R., depot in Amherst, by State Inspector.

15. Sent on from North Amherst, Mass.

16. Collected of D. A. Horton, Northampton, Mass., by State Inspector.

17. White Ash, sent on from South Deerfield, Mass.

	11	*12*	*13*	*14*	*15*	*16*	*17*
	POUNDS PER HUNDRED.						
Moisture at 100° C.	24.50	16.66	18.70	9.30	8.40	16.70	6.62
Calcium Oxide,	33.13	32.25	30.60	34.91	39.71	35.26	50.89
Potassium Oxide,	4.77	4.97	4.61	6.50	4.96	5.55	5.23
Phosphoric Acid,	1.49	1.66	1.10	.78	.89	2.28	1.29
Insoluble Matter,	8.50	10.45	11.06	9.30	6.70	4.90	4.87

Samples 1, 2, 3, 4, 5, 6, represent the average quality of Canada wood ashes sold in our section of the Connecticut river valley, at from 33 to 35 cents per bushel. Sample 7 was of an exceptional light color and contained a larger per cent. of lime, yet compared well otherwise, in composition with the others.

The increasing importation of Canada ashes into various parts of the state, renders it advisible to insist hereafter upon guaranteed analyses, as the basis of commercial transactions.

The universal high opinion of wood ashes as a fertilizer does not depend merely on a fair percentage of potash, but also on the presence of more or less of *all the various mineral elements essential to the growth of plants.*

Wood ashes, like barnyard manure, on account of their compound character, meet to some extent at least, not only known, but unknown deficiencies in valuable soil constituents. The thorough mixture of their various contituents has no doubt a beneficial influence on their action.

18. TOBACCO STEMS.

Sent on by E. S. Warner, Hatfield, Mass.

Moisture at 100° C.	8.95	per cent.
Dry Matter,	91.05	"
Nitrogen in dry matter,	2.69	"
Crude Ash in dry matter,	13.91	"

One hundred part of crude ash contained.

Potassium Oxide,	6.21	per cent.
Sodium Oxide,	0.68	"
Calcium Oxide,	4.76	"
Magnesium Oxide,	1.14	"
Phosphoric Acid,	0.87	"

Silica, Sulphuric Acid, etc., not determined.

VALUATION PER TON OF 2000 POUNDS.

53.80	lbs. of Nitrogen at 18c	$9.68
124.20	" Potassium Oxide at 4¼c.	5.28
17.40	" Phosphoric Acid at 6c.	1.04
		$16.00

The ash of the tobacco plant, like that of other industrial crops, usually varies less in regard to absolute quantity, than to the relative proportion of its essential elementary constituents. Potash is known to vary as high as fifty per cent, in consequence of modes of cultivation and variety of soil, independent of the variety of plant.

As it is claimed by good authority, that an increase or a decrease of the potash in the ash of tobacco stands in a definite relation to certain qualities of the latter, it is proposed to discuss this question more in detail hereafter in the annual report.

19. EEL-GRASS.

Sent on by the South Bristol Farmers' Club, New Bedford, Mass.

I. Was tested soon after collection, and II. after six months exposure to atmospheric influences.

	I.		II.	
Moisture (as sent on),	45.61	per cent.	25.17	per cent.
Ash constituents,	20.39	"	10.81	"
Nitrogen in organic matter,	.70	"	.96	"
Potassium oxide in ash,	1.61	"	.21	"
Sodium " "	2.51	"	.74	"
Calcium " "	1.56	"	2.70	"
Magnesium " "	.09	"	.12	"
Phosphoric acid "	.41	"	.22	"
Insoluble matter, "	.46	"	1.66	"

The composition of the seaweeds in their natural condition is somewhat modified by adhesive sea-shells, sea-water, etc.; no two samples would strictly agree in composition without a previous careful cleaning of the plants. Time and exposure modify organic and inorganic constituents; the alkalies and some of the earthy matters are liable to be washed out in part at least by rain; starchy materials, etc., are decomposed apparently at a higher rate than some of the nitrogenous organic matter.—The entire amount of potash, phosphoric acid and nitrogen contained in the organic vegetable matter is finally available.

Assuming for coarse vegetable organic matter a similar rate of disintegration;—and allowing the same rates of valuation as in Nos. 10 and 18, one ton of I. would be worth $4.38, and one ton of II. $3.90.

20. RED LEATHER SHAVINGS.

Sent on from Marlboro', Mass.

Moisture at 100° C.	40.59	per cent.
Nitrogen in Organic matter,	5.12	"
Ash Constituents,	0.27	"

The fertilizing value of this material is practically unknown. The same may be said of another leather refuse, known as "Chemically Prepared Leather Refuse," referred to in some of my previous reports. The latter consists usually of a coarse powder of a more or less dark brown color. Eight to ten samples, which have thus far been tested at the station, show a variation of from 5.0 to 8.8 per cent. of nitrogen. Its use as a constituent of commercial complete fertilizer, without stating the fact on the package,—is quite properly considered an imposition on the consumer.

Whilst it is desirable that all suitable refuse materials from our various industries should be tried by interested parties regarding their manurial value, it is not less important that the incorporation of any kind of material of an unknown rate of disintegration into compound commercial fertilizers ought to be discouraged.

The best interests of the farmers as well as of the trade in commercial fertilizers are most efficiently promoted by that course of action. To meet the varying *periodical* wants of the growing plants necessitates at all times a liberal supply of available plant food of all kinds. To comply *economically* with that essential requirement, for the successful cultivation of any crop renders it necessary to have at least some approximately correct information regarding the behaviour of the various constituents of fertilizers, when brought under the influence of soil and atmosphere. A disregard of this point on the part of a manufacturer, when compounding his articles for the general market, involves not only serious disappointments to the farmers, who chance to use them, but must ultimately ruin his trade.

PEAT. (21—23).

21. Sent on from Harwich, Barnstable Co., Mass.

22. Sent on from Hudson, Worcester Co., Mass.

23. Sent on from Holyoke, Hampden Co., Mass.

	21	*22*	*23*
	POUNDS PER HUNDRED.		
Moisture at 100° C.	78 26	33.61	54.28
Dry Matter,	21.74	66.39	45.72
Ash constituents in dry matter,	1.31	4.54	33.70
Nitrogen in wet peat,	.41	1.40	.43
Nitrogen in perfectly dry peat,	1.89	2.11	.94

The difference in the composition of samples 21 and 22, is mainly due to their different state of moisture. Both are fair specimens of their kind. The low percentage of nitrogen in sample 23 is caused by an exceptional large admixture of soil. Wherever the entire deposit shows a similar amount of earthy admixture, a direct cultivation, after draining, suggests itself as worth trying.

FISH. (24—30).

24. Dry Fish, sent on by Franklin Farmers' Club.
Guaranteed composition; not stated.

25. Dry Fish, sent on by Milo L. Smith, Smith's Ferry, Mass.
Guaranteed composition; not stated.

26. Dry Fish, of Quinnipiac Fertilizer Co. Collected of E. T. Sabin, East Amherst, Mass., by State Inspector.
Guaranteed composition; total phosphoric acid, 6 to 8 per cent.; soluble and reverted phosphoric acid 2 to 4 per cent.; nitrogen 7 to 9 per cent.

27. Dry Fish of Geo. W. Miles' Co., Milford, Ct. Collected of P. F. Bridges, South Deerfield, Mass., by State Inspector.
Guaranteed composition; Nitrogen 7 to 10 per cent.

28. Half dry Dog Fish Pomace, sent on from Portsmouth, R. I.

29. Fish Pomace of Geo. W. Miles' Co., Milford, Ct. Collected of P. F. Bridges, So. Deerfield, Mass., by State Inspector.

30. Fish Pomace, collected of H. L. Phelps, Northampton, Mass., by State Inspector.

	24	25	26	27	28	29	30
	POUNDS PER HUNDRED.						
Moisture at 100° C.	6.61	7.50	9.45	7.63	11.35	38.11	44.41
Total phosphoric acid,	6.17	7.67	8.39	6.48	5.85	7.49	5.85
Soluble "	2.40	2.32	2.75	2.16	.66	.82	1.57
Reverted "					2.20	2.87	0.62
Insoluble "	3.77	5.35	5.64	4.32	2.99	3.79	3.62
Nitrogen,	8.47	9.36	8.85	8.65	6.96	5.43	5.27
Valuation per 2000 lbs.,	$47.32	$53.18	$51.88	$48.43	$40.58	$35.92	$33.02

31. CASTOR POMACE.

Collected of D. A. Horton, Northampton, Mass., by State Inspector.

Moisture at 100° C.	10.18	per cent.
Total phosphoric acid,	2.13	"
Nitrogen (18 cts. per lb.),	5.69	"
Potassium Oxide,	.92	"
Valuation per 2000 lbs.,	$23.84	

COMPLETE MANURES.

32. Bowker's Hill and Drill Phosphate. Collected of C. F. Brown, Northampton, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid 10 to 12 per cent.; soluble and reverted phosphoric acid (available) 8 to 10 per cent.; Ammonia 2.5 to 3.5 per cent. (equivalent to Nitrogen 2.0 to 2.8); potassium oxide 2 to 3 per cent. (in form of sulphate).

33. Quinnipiac Phosphate. Collected of E. T. Sabin, East Amherst, Mass., by State Inspector.

Guaranteed composition; soluble and reverted phosphoric acid (available) 8 to 10 per cent.; insoluble phosphoric acid, 1 to 3 per cent.; nitrogen, 2.5 to 3.5 per cent.; potassium oxide, 2 to 3 per cent.

34. X L Superphosphate, Bradley Fertilizer Co. Collected of W. S. Westcott, Amherst, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid, 9 to 11 per cent.; soluble phosphoric acid, 7 to 8 per cent.; reverted phosphoric acid 2 to 3 per cent.; insoluble phosphoric acid, 2 to 3 per cent.; nitrogen, 2.5 to 3 per cent.; potassium oxide, 2 to 3 per cent.

35. L. L. Crocker's Complete Manure. Collected of Fuller & Newton, Springfield, Mass., by State Inspector.

Guaranteed composition; soluble phosphoric acid, 6 to 8 per cent.; reverted phosphoric acid, 2 to 4 per cent; insoluble phosphoric acid, 1 to 2 per cent.; Ammonia, 2.5 to 3.4 per cent. (nitrogen, 2.06 to 2.89); potassium oxide, 6 to 8 per cent.

	32	33	34	35
	POUNDS PER HUNDRED.			
Moisture at 100° C.	15.50	22.05	14.08	16.19
Total phosphoric acid,	10.47	12.99	10.45	10.94
Soluble "	8.26	4.86	8.42	6.78
Reverted "	1.00	5.82	0.63	1.53
Insoluble, "	1.21	2.31	1.40	2.63
Nitrogen,	2.42	2.76	2.87	2.49
Potassium Oxide,	1.85	2.80	1.82	4.65
Valuation per 2000 lbs.,	$34.94	$37.43	$35.95	$35.94

C. A. GOESSMANN, *Director*,

AMHERST, MASS.

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AGRICULTURAL EXPERIMENT STATION.

BULLETIN No. 3.

SEPTEMBER, 1883.

FODDER ANALYSES.

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36. HAY OF BLACK GRASS. (No. One).

Sent on by the Secretary of the Rowley Farmer's Club, Rowley, Essex Co., Mass., in April, 1883.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	10.22	204.4	Not ascertained by actual feeding experiment.		
Dry Matter,	89.78	1795.6			
	100.00	2000.			
ANALYSIS OF DRY MATTER.					
Crude Ash,	8.63	172.6			
" Cellulose,	24.78	495.6			
" Fat,	1.52	30.4			
" Protein, (nitrogenous matter),	9.39	187.8			
Non-nitrogenous extract matter,	55.68	1113.6			
	100.	2000.			

The grass was cut before blooming on the 24th of June, 1882; it would have matured, according to the letter of the Secretary, by the 10th of July. The hay had been housed as soon as cured.

37. HAY OF BLACK GRASS. (No. Two).

Sent on by the Rowley Farmer's Club, in April, 1883.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents	Nutritive Ration.
Moisture at 100° C., ...	13.15	263.0	Not ascertained by actual feeding experiment.		
Dry Matter, ...	86.85	1737.0			
	100.00	2000.			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	6.50	130.0			
" Cellulose, ...	23.66	573.2			
" Fat, ...	1.20	24.0			
" Protein, (nitrogenous matter),	7.15	143.0			
Non-nitrogenous extract matter, . .	61.49	1139.8			
	100.	2000.			

The grass which served for the production of hay No. two was cut when it began to look red, approaching maturity,—on the 24th of July, 1882. The hay had been housed as soon as cured.

38. HAY OF HIGH MARSH GRASS. (No. Three).

Sent on by the Rowley Farmer's Club, in April, 1883.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents	Nutritive Ration.
Moisture at 100° C., ...	11.05	221.			
Dry Matter, ...	88.95	1779.0			
	100.00	2000.			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	6.18	123.6			
" Cellulose, ...	24.81	496.2			
" Fat, ...	0.98	19.6			
" Protein (nitrogenous matter),	6.14	122.8			
Non-nitrogenous extract matter, . .	61.89	1237.8			
	100.	2000.			

The grass was cut in July, 1882, and the hay had been stored away in the barn as soon as cured. No statement was made with reference to the particular stage of growth of the grass at the time of cutting.

Three more samples of hay obtained from "Low Marsh Grass," under different circumstances, by members of the Rowley Farmer's Club, are still under investigation. The results of this work, accompanied by a short discussion of several questions, which suggests themselves quite naturally in an investigation like the above, will be published as soon as possible in a subsequent bulletin.

39. NEBRASKA RED CORN.

Sent on from Franklin Co., Mass.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	10.74	214.8			
Dry Matter, ...	89.26	1785.2			
	100.00	2000.			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	1.29	25.8			1:6.91
" Cellulose, ...	3.00	60.	20.4	34	
" Fat, ...	5.40	108.	82.08	76	
" Protein (nitrogenous matter),	12.64	252.8	214.88	85	
Non-nitrogenous extract matter, . .	66.93	1338.6	1258.28	95	
	89.26	2000.0	1575.64		

The detailed results of a chemical examination, regarding the nutritive value, of various prominent varieties of corn raised in Massachusetts, as compared with western and southern corn, may be found in the annual report of the Secretary of the Mass. State Board of Agriculture, for 1879. A comparison of the above stated analytical results, with those referred to,—show a high nutritive value for the red variety. Whether this result is mainly due to a high state of fertilization of the soil, which served for its production, or to an inherent superiority of this variety of corn, further observation only can decide.

FERTILIZER ANALYSES.

40. Ammonium Sulphate. Collected of Geo. P. Smith, Sunderland, Mass., by State Inspector.

Guaranteed composition; ammonia 24 to 25 per cent., (equivalent to nitrogen 19.75 to 20.5 per cent.).

Moisture at 100° C.,	0.23 per cent.
Ammonia (equivalent to nitrogen, 20.4),	24.80 "
Sulphuric acid,	61.60 "
Insoluble matter,	0.05 "
Valuation per 2000 lbs.,	$106.08

41. Nitrate of Soda. Collected of D. A. Horton, Northampton, Mass., by State Inspector.

Moisture at 100° C.,	1.25 per cent.
Nitrogen,	15.57 "
Insoluble matter,	.45 "
Valuation per 2000 lbs.,	$62.28

42. Raw Wool. Fleece from Argentine Republic, sent on for examination from Clinton, Mass.

Moisture at 100° C.,	6.95 per cent.
Organic and Volatile Matter,	92.46 "
Ash constituents,	7.54 "
Fatty matter (ether abstract),	3.92 "
Nitrogen,	12.88 "
Insoluble matter,	3.63 "

One hundred parts of wool washings contained:—

	I. *With Acidulated Water.*	II. *With Hot Water.*
Potassium oxide,	4.20 per cent.	3.92 per cent.
Sodium oxide,	.40 "	.49 "
Calcium oxide,	.61 "	.28 "
Magnesium oxide,	.20 "	None
Ferric oxide,	.13 "	"
Phosphoric acid,	traces "	"

The above stated analytical results of "Raw Wool" do not apply to "wool-waste" from factories; for the latter material is as a rule more or less mixed with foreign substances as sweepings, etc. The nitrogen of wool-waste has varied in my own experience from 6.25 per cent. as the highest, to 3.76 per cent. the lowest result.

The amount of fertilizing material (potash, phosphoric acid and nitrogen) removed from 100 pounds of *raw wool* in consequence of washing, has been found in a series of tests to be worth at present rates of valuation from 46 to 47 cents.

43. Nova Scotia Plaster (Gypsum). Collected of D. A. Horton, Northampton, Mass., by State Inspector.

Moisture at 100° C.,	15.79 per cent.
Calcium oxide,	34.29 "
Magnesium oxide,	0.36 "
Sulphuric acid,	47.14 "
Insoluble matter,	1.42 "
Carbonic acid,	Not determined.

This gypsum contained a few per cent of calcium and magnesium carbonates, which not unfrequently are associated with it.

POTASH COMPOUNDS. (44—47).

44. Muriate of Potash, of Quinnipiac Fertilizer Co., New London, Ct. Collected of E. T. Sabin, East Amherst, Mass., by State Inspector.

45. Muriate of Potash. Collected of G. P. Smith, Sunderland, Mass., by State Inspector.

46. Muriate of Potash, of Bowker Fertilizer Co., Boston, Mass. Collected by State Inspector.

44 - 45. 46.

	POUNDS PER HUNDRED.		
Moisture at 100° C.,	2.89	2.85	2.89
Potassium oxide,	50.05	50.59	50.40
Sodium oxide,	8.30	8.40	8.30
Magnesium oxide,	0.60	trace	0.60
Sulphuric acid,	0.28	trace	0.28
Insoluble matter,	0.15	1.50	0.15
Valuation per 2000 lbs.,	$42.54	$43.00	$42.84

This form of the "German Potash Salts" has thus far proved a very reliable source of potassa for general agricultural purposes; an extensive application has caused of late some advance of its cost, as compared with previous years.

47. Potash Magnesia Sulphate, of Bowker Fertilizer Co. Collected by State Inspector.

Moisture at 100° C.,	4.90	per cent.
Calcium oxide,	1.15	"
Magnesium oxide,	11.30	"
Potassium oxide,	24.94	"
Sodium oxide,	2.09	"
Sulphuric acid,	46.99	"
Insoluble matter,	0.54	"
Valuation per 2000 lbs.,		$34.92

The above compound belongs to a series of salines which some ten years ago, under the name of "German Potash Salts" or "Stassfurt Salines," were introduced into our agricultural industry for manurial purposes. Its peculiarity consists in the combination of a large amount of potassium sulphate, from 46 to 47 per cent., with a remarkable quantity of magnesium sulphate, from 33 to 34 per cent. The magnesium sulphate stands foremost among substances noted for their quality to counteract the well known great retentive power of most soils for potassa. This circumstance renders the Potash-Magnesia sulphate a very valuable material for the cultivation of deep rooting plants, in case of an exhaustion of potassa in the subsoil.

The Potash-Magnesia Sulphate, as well as the "Douglass Muriate of Potash," occupy a peculiar position among our recently introduced potash resources for manurial purposes. The former has proved the preferable compound where the presence of large quantities of chlorides is known to affect seriously the quality of the vegetable growth, as in the case of tobacco, etc.; whilst the latter recommends itself, on account of from 70 to 75 per cent. of muriate of potash, in presence of from 15 to 20 per cent. of sulphate of magnesia, for deep-rooting forage plants.

A detailed discussion of the character and special fitness of the various brands of German Potash Salts for agricultural purposes, can be found in the annual report of the Secretary of the Mass. State Board of Agriculture for 1874.

BONES. (48—52).

48. Fine Ground Raw Bones, sent on from Worcester, Mass.

49. Holyoke Bone Saw Dust, of Holyoke Manufacturing Co. Collected of D. A. Horton, Northampton, Mass., by State Inspector.

50. Darling's Fine Bones. Collected of Parker & Gannet, Boston, Mass., by State Inspector.

51. Ground Fine Bones, of Bowker Fertilizer Co., Boston, Mass.

52. Bradley's Fine Ground Bones. Collected of Breck & Son, Boston, Mass., by State Inspector.

	48	*49*	*50*	*51*	*52*
	POUNDS PER HUNDRED.				
Moisture at 100° C.,	4.63	9.50	7.10	6.53	7.17
Total phosphoric acid,	22.41	24.96	25.45	23.82	23.28
Nitrogen,	3.69	3.97	2.90	3.83	3.95
Valuation per 2000 lbs.,	$43.86	$48.21	$43.88	$46.20	$46.11

The majority of these samples are fair representatives of refuse bones from rendering establishments. They were well ground, porous and friable, and thus in a favorable condition for speedy action. Sample 49 being the waste material from another industry, consisted of a uniform finely ground mass, yet was compact, gritty and hard. A previous composting or an earlier application will here materially assist to secure an economical return from the investment.

FISH. (53—55).

53. Dry Ground Fish, sent on from South Hadley Falls, Mass.
Guaranteed composition not. stated.

54. Bowker's Dry Fish. Collected of C. T. Brown, Northampton, Mass., by State Inspector.

Guaranteed composition; ammonia 10 to 12 per cent. (equivalent to nitrogen 8.25 to 9.9 per cent.).

55. Chittenden's Dry Ground Fish, of National Fertilizer Co., Bridgeport, Ct. Collected of J. A. Sullivan, Northampton, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid 6 to 8 per cent.; ammonia 8 to 10 per cent. (equivalent to nitrogen 6.5 to 8.25 per cent.

	53	54	55
	POUNDS PER HUNDRED.		
Moisture at 100° C.,	10.38	9.02	10.78
Total phosphoric acid,	6.0[illegible]	8.07	6.58
Soluble phosphoric acid, Reverted, "	2.82	3.68	3.00
Insoluble phosphoric acid,	3.18	4.39	3.58
Nitrogen,	6.13	8.32	7.20
Valuation per 2000 lbs.,	$36.53	$49.43	$42.22

FISH AND POTASH. (56—28).

56. Chittenden's Fish and Potash, of National Fertilizer Co., Bridgeport, Ct. Collected of J. A. Sullivan, Northampton, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid 6 to 8 per cent.; potassium oxide 4 to 6 per cent.; ammonia 3 to 5 per cent. (equivalent to nitrogen 2.5 to 4 per cent.).

57. Fish and Potash, of Geo. W. Miles' Co., Milford, Ct. Collected of P. F. Bridges, So. Deerfield, Mass., by State Inspector.

Guaranteed composition; soluble and reverted phosphoric acid (available) 5 to 8. per cent.; potassium oxide 4 to 6 per cent.; ammonia 4 to 6 per cent., (equivalent to nitrogen 3.25 to 5 per cent.

58. Fish and Potash. No. One, of Quinnipiac Fertilizer Co., New London, Ct. Collected of E. T. Sabin, East Amherst, Mass.

Guaranteed composition; total phosphoic acid 5 to 7 per cent.; soluble and reverted phosphoric acid (available) 3 to 5 per cent.; insoluble phosphoric acid 2; potassium oxide 3 to 5 per cent.; nitrogen 3.25 to 4.25 per cent.

	56	57	58
	POUNDS	PER HUNDRED.	
Moisture at 100° C.,	10.60	13.78	19.67
Total phosphoric acid,	6.04	7.57	7.90
Soluble "	0.32	3.44	.50
Reverted "	2.45	1.50	5.50
Insoluble "	3.27	2.63	1.90
Potassium oxide,	4.34	4.59	4.30
Nitrogen,	2.76	3.63	3.73
Valuation per 2000 lbs.,	$24.93	$33.73	$33.00

AMMONIATED SUPERPHOSPHATES AND COMPLETE MANURES. (59—70).

59. Sparrow's Bone and Potash Phosphate, of Judson & Sparrow. Collected of Everett & Gleason, Boston, Mass. By State Inspector.

Guaranteed composition; soluble phosphoric acid 9 to 11 per cent.; potassium oxide 4 to 5 per cent.; ammonia 3 to 4 per cent. (equivalent to nitrogen 2.5 to 3.3 per cent.).

60. Mitchell's Standard Phosphate. Collected of J. & J. A. Rice, Worcester, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid 12.42 per cent.; soluble phosphoric acid 9.85 per cent.; insoluble phosphoric acid 2.57 per cent.; potassium oxide 2.16 per cent.; nitrogen 2.64 per cent.

61. Standard Superphosphate, of Standard Fertilizer Co., Boston, Mass. Collected of Wm. H. Earle, Worcester, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid 13 to 15 per cent.; soluble and reverted phosphoric acid (available) 9 to 13 per cent.; insoluble phosphoric acid 2 to 4 per cent.; potassium oxide 2 to 4 per cent.; magnesium oxide 1.5 to 2 per cent.; ammonia 2 to 4 per cent. (equivalent to nitrogen 1.6 to 3.3 per cent.

62. Bay State Ammoniated Bone Superphosphate. Collected of J. S. Clark & Son, Worcester, Mass., by State Inspector.

Guaranteed composition ; soluble and reverted phosphoric acid (available) 9 to 10 per cent. ; insoluble phosphoric acid 2 to 3 per cent. ; ammonia 3.5 to 4 per cent. (equivalent to nitrogen 2.9 to 3.3 per cent.

	59	60	61	62
	POUNDS PER HUNDRED.			
Moisture at 100° C.,	14.75	16.10	19.38	26.78
Total phosphoric acid,	12.06	11.56	12.14	10.10
Soluble "	11.60	6.10	7.29	7.33
Reverted "	.22	.94	2.09	1.25
Insoluble "	.24	4.52	2.76	1.52
2 Magnesium oxide, ✓ P	3.89	4.24	1.51	
/ Potassium oxide, X. Mg			1.50	
Nitrogen,	3.39	2.23	1.81	3.30
Valuation per 2000 lbs.,	$45.06	$34.20	$32.30	$35.13

63. Complete Manure. Potatoes and Vegetables, of H. L. Phelps, Northampton, Mass. Collected by State Inspector.

Guaranteed composition; soluble and reverted phosphoric acid (available) 5 to 6 per cent. ; potassium oxide (sulphate) 5 to 7 per cent. ; ammonia (in form of organic matter and ammonia salts) 4 to 5 per cent. (equivalent to nitrogen 3.3 to 4.1 per cent.

64. Darling's Lawn-Dresser. Collected of Parker & Gannet, Boston, Mass., by State Inspector.

Guaranteed composition ; total phosphoric acid 10 to 13 per cent. ; potassium oxide 5 to 6 per cent. ; ammonia 5 to 6 per cent. (equivalent to nitrogen 4.1 to 4.9 per cent.).

65. Bowker's Lawndressing. Collected of C. T. Brown, Northampton, Mass., by State Inspector.

Guaranteed composition ; total phosphoric acid 6 to 8 per cent. ; soluble and reverted phosphoric acid (available) 5 to 6 per cent. ; potassium oxide 4 to 5 per cent. ; nitrogen 4 to 5 per cent.

66. Bradley's X L Ammoniated Bone Superphosphate. Collected of Parker & Gannet, Boston, Mass., by State Inspector.

Guaranteed composition ; soluble phosphoric acid 7 to 8 per cent. ; reverted phosphoric acid 2 to 3 per cent. ; insoluble phosphoric acid 2 to 3 per cent. ; potassium oxide 2 to 3 per cent. ; nitrogen 2.5 to 3.25 per cent.

	63	64	65	66
	POUNDS PER HUNDRED.			
Moisture at 100° C.	12.08	9.43	10.83	15.80
Total phosphoric acid,	8.20	10.83	7.86	12.31
Soluble "	4.80	0.58	5.09	8.37
Reverted "	2.25	2.40	0.64	1.03
Insoluble, "	1.15	7.85	2.13	2.91
Potassium Oxide,	4.62	6.14	3.71	2.64
Nitrogen (in form of organic matter),	1.87	4.47	5.06	3.10
Nitrogen (in form of ammonia salts),	1.82			
Valuation per 2000 lbs.,	$40.07	$40.32	$41.21	$40.05

67. Dole's Common Sense Fertilizer. No. Three. Collected of J. A. Sullivan, Northampton, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid 4 to 6 per cent.; potassium oxide 3 to 5 per cent.; nitrogen 3 to 6 per cent.

68. Bosworth Bros'. Superphosphate of Lime. Collected of Wilson & Holden, Worcester, Mass., by State Inspector.

Guaranteed composition; soluble phosphoric acid 7 to 8 per cent.; reverted phosphoric acid 4 to 5 per cent.; insoluble phosphoric acid 2 to 5 per cent.; potassium oxide 2 to 3 per cent.; nitrogen 2 to 2.5 per cent.

69. Russell Coe's Ammoniated Bone Superphosphate. Collected of Wm. H. Earle, Worcester, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid 12 to 15 per cent.; soluble and reverted phosphoric acid (available) 10 to 12 per cent.; potassium oxide 2.5 to 4 per cent.; nitrogen 1.75 to 2.5 per cent.

70. Sparrow's Grass Fertilizer of Judson & Sparrow. Collected of Everett & Gleason, Boston, Mass., by State Inspector.

Guaranteed composition; soluble and reverted phosphoric (available) 8 to 9 per cent.; potassium oxide 4 to 5 per cent.; ammonia 5 to 6 per cent. (equivalent to nitrogen 4.1 to 4.9 per cent.

	67	68	69	70
	POUNDS PER HUNDRED.			
Moisture at 100° C.,	14.20	8.26	16.52	10.40
Total phosphoric acid,	5.98	16.60	8.44	9.60
Soluble "	.57	3.60	4.22	7.45
Reverted "	2.35	5.10	1.13	1.09
Insoluble "	3.06	7.90	3.09	1.06
Potassium oxide,	3.33	2.06	1.40	4.28
Nitrogen,	1.49	2.13	2.95	4.73
Valuation per 2000 lbs.,	$18.36	$36.21	$29.56	$44.80

C. A. GOESSMANN, *Director*,

AMHERST, MASS.

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BULLETIN No. 5.

NOVEMBER, 1883.

FODDER ANALYSES.

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101. HAY OF WINTER RYE.

Sent on by the Secretary of the Mass. State Board of Agriculture, John E. Russell.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	8.55	171.00			
Dry Matter, ...	91.45	1829.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	6.40	128.00			1 : 8.28
" Cellulose, ...	32.97	659.40			
" Fat, ...	2.57	51.40	23.65	46.00	
" Protein, (nitrogenous matter),	10.66	213.20	121.52	57.00	
Non-nitrogenous extract matter, . .	47.40	948.00	948.00	100.00	
	100.00	2000.00	1093.17		

The sample was cut May 25, 1883, when in full blossom; it is of a fair quality and compares well with a medium good quality of meadow hay. The rate of digestibility stated in connection with the non-nitrogenous extract matter of the hay includes that of the crude cellulose or raw fibre. Green Winter Rye in blossom may contain from 20 to 26 per cent. of vegetable matter, and from 80 to 74 per cent. of water.

102. HAY OF OATS.

From one of the experimental plots of the Station.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ration.
Moisture at 100° C.,	6.43	128.60			
Dry Matter,	93.57	1871.40			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					1:14.24
Crude Ash,	6.41	128.20			
" Cellulose,	34.06	681.20			
" Fat,	2.92	58.40	26.86	46.00	
" Protein, (nitrogenous matter),	6.58	131.60	75.01	57.00	
Non-nitrogenous extract matter,	50.03	1000.60	1000.60	100.00	
	100.00	2000.00	1102.47		

The sample was collected, when in full blossom; its composition can scarcely be called a fair one. The dry vegetable matter of oats in blossom may vary from 15 to 20 per cent. of the weight of the green plant.

Actual field experiments have shown, that the condition and the quality of the soil, aside of season and of climate, exert a decided influence not only on the quantity, but also on the quality of the crops raised upon it. This fact deserves particular attention in the cultivation of forage crops. Oats raised during the same season upon the same kind of soil, with the aid of manures and without them, has been noticed to contain, in the latter case as low as five and in the former as high as eleven per cent. of nitrogenous constituents in its dry vegetable matter. The existence of similar relations between the particular condition of the soil and the composition of the crops has been proved in regard to most of our prominent grasses, and leguminous plants as clover, as well as of mixed forage crops like meadow hay. A high percentage of nitrogenous constituents in these crops is usually accompanied by a high percentage of phosphoric acid compounds. As both are known to exert a decidedly beneficial influence on the absolute and relative nutritive value of a single article of fodder, may it be an entire plant or a particular part of it, it needs scarcely any farther argument to prove that an economical system of feeding our farm stock ought to begin with an intelligent cultivation of our leading fodder crops. We ought to raise them with a view to promote the special development of their most valuable nutritive constituents; and to select the crops for cultivation with reference to the particular adaptation of soil, climate and location *to favor the production of the best of its kind.* The introduction of a greater variety of fodder crops cannot fail to assist materially in gaining the desirable end. To raise good potatoes for family use, or good sugar-beets for the sugar manufacturer, requires a different condition of the soil as far as the character of its accumulated plant food is concerned, than to raise both crops of a superior quality for feeding purposes. A mealy potato is usually rich in starch and comparatively speaking deficient in nitrogenous matter; and sugar-beets best adapted for the manufacture of sugar are rich in sugar and contain a low percentage of nitrogenous constituents; they yield to the manufacturer the largest amount of sugar at the lowest expense. The garden-farmer and the manufacturer of sugar judge the quality of their respective crops by a standard quite different from that of the farmer, who, engaged in general farming, considers stock feeding an important part of his industry.

To compound an economical and suitable diet for any class of farm animals requires not only a general knowledge of the composition of the fodder on hand, but also a fair acquaintance with the relative proportion of the three groups of essential nutritive constituents they are apt to contain under different conditions of the soil. This kind of information is as essential for the guidance of the experimenter, as the knowledge of the special wants of the animal with reference to its organization, age, and functions. The wide range of variations in composition which has been noticed in our leading fodder crops when raised upon rich or exhausted lands, renders many of our current tabular statements of the chemical composition of the more prominent articles of fodder of *doubtful merit in the hands of the farmer, who considers them an unfailing guide in his special case.* The majority of these fodder tables may be traced to one source (E. Wolff) ; they state the mean of a smaller or larger number of analyses, quite frequently made without any intention to ascertain the possible variations in the composition of the article under investigation. The analytical statements themselves refer in the majority of cases to plants raised in Germany and in other European countries. Whilst the great value of these tables from an agricultural educational standpoint must be conceded ; their analytical statements require a qualification before they may be safely relied on in home practice. The annual report of the Secretary of the Mass. State Board of Agriculture for 1882, pages 104 to 114, contain a tabular statement of the composition of many fodder crops, giving the extremes (highest and lowest percentages found) with reference to each group of the nutritive constituents. This mode of stating the composition of the various farm crops, tends to direct the attention more decidedly towards the advantages arising from a proper cultivation of fodder crops. The experiment station has entered upon a systematic course of investigation to assist in determining the influence of stage of growth and of cultivation on the feeding value of some of our prominent forage plants.

103. COTTON SEED MEAL. (1)

Sent on by J. E. Soper & Co., of Boston.

Eighty-six per cent. passed through mesh of 144 to the square inch.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	7.10				
Dry Matter, ...	92 90				
	100.00				
ANALYSIS OF DRY MATTER.					1:1.44
Crude Ash, ...	9.34	186.80			
" Cellulose, ...	7.53	150.60	34.63	23.00	
" Fat, ...	13.75	275.00	250.25	91.00	
" Protein (nitrogenous matter),	42.58	851.60	630.18	74.00	
Non-nitrogenous extract matter, . .	26.80	536.00	246.56	46.00	
	100.00	2000.00	1161.62		

The composition of the above article does not materially differ from that of previously reported analyses; the variations are within the limits noticed in fair samples of cotton seed meal, its mechanical condition was of a superior character. The meal was produced, according to the statement of the dealer by a new process, "Roller-process," and sifted.

104. GLUTEN MEAL.

(Refuse from Glucose Manufacture.)

Sent on by Newton & Fuller, Springfield, Mass.

Eighty-three per cent. passed through mesh 144 to the square inch.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	10.23	204.60	Not determined by actual experiment.		
Dry Matter.	89.77	1795.40			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	.65	13.00			
" Cellulose, ...	1.20	24.00			
" Fat, ...	5.06	101.20			
" Protein, (nitrogenous matter),	33.56	671.20			
Non-nitrogenous extract matter, . .	59.53	1190.60			
	100.00	2000.00			

The article was of a good mechanical condition. A comparison of the analysis No 6, in Bulletin No. 1, shows that the above sample contained 3 per cent. of fat and 5 per cent. of nitrogenous matter less than that of No. 6, whilst its soluble non-nitrogenous matter exceeds that of the latter about 10 per cent. No free sulphuric acid was noticed. The discussion of this new article of fodder in connection with analysis No. 6, applies here. Considerable interest has of late been manifested regarding its use for milk production. This analysis as well as the previous one of cotton seed meal, No. 103, was made at the special request of the editor of the *New England Homestead.*

105. EXAMINATIONS OF SKIM MILK FOR FAT.

Samples sent on at different times for examination.

Sample Nos.	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Amt. of Fat in 100 parts.	.26	.31	.38	.30	38	.37	.35	.48	.54	.48

FERTILIZER ANALYSES.

TURF.

106. Sent on by Horace Graves, Amherst, Mass.

I. Turf from upper layer, consisting largely of leaves, roots and mosses; brown, colored and fibrous.

II. Turf from lower layer, consisting of a brown peat-like mass; taken from four feet below the surface and exposed to the air one year.

	I.		II.	
Moisture at 100° C.,	25.58	per cent.	13.00	per cent.
Organic and Volatile Matter,	96.72	"	90.57	"
Ash constituents,	3.28	"	9.43	"
Nitrogen (in wet peat),	1.91	"	1.97	"

The upper layer may be used advantageously as bedding and as an absorber of liquid manure; the lower layer ought to be composted with lime or ashes before it is incorporated in the soil; both samples are of a good quality.

107. Ash of Bogs. Sent on by J. B. Wheeler, Bolton, Mass.

Moisture at 100° C.,	5.05	per cent.
Calcium oxide,	3.09	"
Magnesium oxide,	1.13	"
Potassium Oxide,	.16	"
Phosphoric acid,	.93	"
Insoluble matter,	70.92	"

The ashes were obtained from the burning of the surface growth of a swamp meadow lately in part underdrained. Bogs, hassocks and a few inches thickness of the turf, furnished the ash. The dried-up condition of the vegetable matter explains the presence of but a small quantity of potash. The ash may prove beneficial upon adjoining grass-lands.

108. Ashes from Detroit. Sent on by John Lane, Esq., of East Bridgewater, Mass.

Moisture at 100° C.,	6.39 per cent.
Calcium oxide,	34.15 "
Potassium oxide,	1.00 "
Phosphoric acid,	2.05 "
Magnesium oxide,	3.72 "
Insoluble matter,	22.10 "

The ash had evidently been leached before it entered the market.

109. Green Mountain Odorless Fertilizer, of Geo. W. Maynard, Lawrence, Mass. Sent on from Salem, Mass.

Moisture at 100° C.,	19.40 per cent.
Sulphuric acid,	2.61 "
Chlorine,	7.69 "
Calcium oxide,	33.39 "
Potassium oxide,	·44 "
Phosphoric acid,	1.37 "
Ferric oxide,	1.03 "
Sodium oxide,	7.55 "
Insoluble matter,	5.15 "

FISH AND POTASH. (110—112).

110. Fish and Potash [s], of George W. Miles' Co., Milford, Ct. Collected of D. J. Wright, Northampton, Mass., by State Inspector.

Guaranteed composition; soluble and reverted phosphoric acid (available), 5 to 8 per cent.; potassium oxide, 4 to 6 per cent.; ammonia, 4 to 6 per cent. (equivalent to 3.3 to 5 per cent. nitrogen).

111. Fish and Potash, of Geo. W. Miles' Co., Milford, Ct. Collected of P. F. Bridges, So. Deerfield, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid, 5 to 8 per cent.; potassium oxide, 3 to 5 per cent.; nitrogen, 2.5 to 3.5 per cent.

112. Fish and Potash, of Quinnipiac Fertilizer Co., New London, Ct. Collected of William H. Earle, Worcester, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid, 5 to 7 per cent.; soluble and reverted phosphoric acid (available), 3 to 5 per cent.; potassium oxide, 3 to 5 per cent.; nitrogen, 3.25 to 4.25 per cent.

	110	*111*	*112*
	POUNDS PER HUNDRED.		
Moisture at 100° C.	15.60	27.69	24.08
Total phosphoric acid,	7.51	4.52	5.93
Soluble "	4.88		.93
Reverted "	.07	1.14	1.95
Insoluble, "	2.56	3.38	3.05
Potassium Oxide,	4.52	2.57	3.91
Nitrogen,	2.70	2.77	4.27
Valuation per 2000 lbs.,	$30.18	$20.80	$31.79

Correction. Fertilizer No. 86, Bulletin No. 4, "Bradley's Fish and Potash," the valuation of the article ought to read $27.98 instead of $37.98.

AMMONIATED SUPERPHOSPHATES AND COMPLETE MANURES.

113. Chittenden's Complete Manure, Grain, of National Fertilizer Co., Bridgeport, Conn. Collected of J. A. Sullivan, Northampton, Mass., by State Inspector,

Guaranteed composition; total phosphoric acid 8 to 10 per cent.; soluble and reverted phosphoric acid, (available) 6 to 8 per cent.; potassium oxide 5 to 7 per cent.; ammonia 4½ to 5½ per cent., (equivalent to nitrogen 3.71 to 4.53 per cent.).

114. Bowker's Hill and Drill Phosphate. Collected of Fuller & Newton, Springfield, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid 10 to 12 per cent.; soluble and reverted phosphoric acid (available) 8 to 10 per cent.; potassium oxide (in form of sulphate) 2 to 4 per cent.; ammonia 2 to 3½ per cent., (equivalent to nitrogen 1.65 to 2.88 per cent.

115. Stearns' Ammoniated Bone Superphosphate, of Stearns & Co., New York. Collected of Wilson & Holden, Worcester, Mass., by State Inspector.

Guaranteed composition; soluble and reverted phosphoric acid, (available) 8 to 10 per cent.; potassium oxide 2 to 3 per cent.; ammonia 3 to 4 per cent., (equivalent to nitrogen 2.47 to 3.30 per cent.

116. Dole's Common Sense Fertilizer. (No. two). Collected of Parker & Gannet, Springfield, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid 4 to 8 per cent.; potassium oxide 3 to 5 per cent.; ammonia 3 to 6 per cent., (equivalent to nitrogen 2.59 to 5.18 per cent.

	113	*114*	*115*	*116*
	POUNDS PER HUNDRED.			
Moisture at 100° C.,	14 17	14.22	14.48	23.51
Total phosphoric acid,	8.38	10.31	10.30	4.93
Soluble "	5.14	4.54	3.04	.64
Reverted "	1.50	1.77	6.12	3.30
Insoluble "	1.74	4.00	1.14	1 26
Potassium oxide,	5 38	1.30	2.15	3.34
Nitrogen, (in organic matter),	3.04	2.22	1.99	.84
Nitrogen, (in ammonia salts),				1.06
Nitrogen, (in nitrates),	.14			
Valuation per 2000 lbs.,	$34.91	$29.65	$28.83	$20.41

117. Bone Superphosphate, of Lowell Bone Fertilizer Co., Lowell, Mass. Collected of R. C. Lord, Lowell, Mass., by State Inspector.

Guaranteed composition; moisture 5.9 per cent.; soluble phosphoric acid 14.68 per cent.; reverted phosphoric acid .32 per cent.; insoluble phosphoric acid, .86 per cent.; nitrogen 3.37 per cent.

118. Bay State Bone Superphosphate, of J. J. Tucker, Boston, Mass. Collected of Geo. B. Knowlton, Fitchburg, Mass., by State Inspector.

Guaranteed composition; soluble and reverted phosphoric acid (available) 9 to 10.5 per cent.; insoluble phosphoric acid 1.5 to 3 per cent.; ammonia 3 to 4 per cent., (equivalent to nitrogen 2.5 to 3.3 per cent.

119. Stockbridge Manures. Grass Top Dressing. Collected of J. Breck & Son, Boston, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid 6 to 8 per cent.; soluble and reverted phosphoric acid (available) 5 to 6 per cent.; potassium oxide 4 to 5 per cent.; nitrogen 4.25 to 5 per cent. (equivalent to ammonia 5 to 6 per cent.)

120. Bradley's XL Ammoniated Bone Superphosphate. Collected of J. & J. A. Rice, Worcester, Mass., by State Inspector.

Guaranteed composition; soluble phosphoric 7 to 8 per cent.; reverted phosphoric acid 2 to 3 per cent.; insoluble phosphoric acid 2 to 3 per cent.; potassium oxide 2 to 3 per cent.; nitrogen 2.5 to 3.5 per cent.

	117	*118*	*119*	*120*
	POUNDS PER HUNDRED.			
Moisture at 100° C.,	10.45	22.45	18.25	17.50
Total phosphoric acid,	16.03	10.95	8.32	12.40
Soluble "	11.69	8.80	5.56	6.81
Reverted "	3.97	.71	.97	3.04
Insoluble "	.37	1.44	1.79	2.55
Potassium oxide,			5.65	1.92
Nitrogen, (in organic matter),	2.82	3.12	4.16	2.65
Nitrogen, (in nitrates),			1.90	
Valuation per 2000 lbs.,	$45.48	$36.58	$47.47	$36.72

121. E. Frank Coe's Bone Superphosphate of Lime. Manufactued by Enoch Coe, Hunter's Point, N. Y. Collected of J. S. Clark & Son, Worcester, Mass., by State Inspector.

Guaranteed composition; soluble and reverted phosphoric acid (available), 11.96 per cent.; insoluble phosphoric acid, 1.28 per cent.; nitrogen, 2.64 per cent.

122. Quinnipiac Co's. Phosphate. Collected of Wm. H. Earle, Worcester, Mass., by State Inspector.

Guaranteed composition; soluble and reverted phosphoric acid (available), 8 to 10 per cent.; insoluble phosphoric acid, 1 to 3 per cent.; potassium oxide, 2 to 3 per cent.; nitrogen, 2.5 to 3.5 per cent.

123. IXL Ammoniated Bone Superphosphate, of Geo. W. Miles' Co., Milford, Ct. Collected of D. J. Wright, Northampton, Mass., by State Inspector.

Guaranteed composition; soluble and reverted phosphoric acid (available), 8 to 12 per cent.; potassium oxide, 1 to 3 per cent.; ammonia, 2.5 to 4 per cent. (equivalent to nitrogen 1.65 to 3.30 per cent.

124. Bay State Ammoniated Bone Superphosphate, of J. J. Tucker, Boston, Mass. Collected of H. A. Emerson, Winchester, Mass., by Chemist of the Station.

Guaranteed composition; total phosphoric acid, 12.20 per cent.; soluble and reverted phosphoric acid (available), 9.20 per cent.; insoluble phosphoric acid, 3.00 per cent.; ammonia, 3.29 per cent. (equivalent to nitrogen 2.71 per cent.).

	121	*122*	*123*	*124*
	POUNDS PER HUNDRED.			
Moisture at 100° C.,	22.90	19.10	19.04	27.67
Total phosphoric acid,	9.97	11.03	11.95	9.58
Soluble "	7.84	7.96	6.94	7.34
Reverted "	.43	1.45	1.49	.66
Insoluble "	1.70	1.62	3.52	1.58
Potassium oxide,		2.04	1.83	.75
Nitrogen, (in organic matter),	2.54	2.08	2.25	3.20
Nitrogen, (in nitrates),		.79		
Valuation per 2000 lbs.,	$31.66	$36.23	$33.78	$34.47

125. Dole's Common Sense Fertilizer (D). Collected of Parker & Gannet, Springfield, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid, 1 to 3 per cent.; potassium oxide, 1 to 3 per cent.; nitrogen, 2 to 4 per cent.

126. Bradley's Complete Manure; Potato and Roots. Collected of J. Breck & Son, Boston, Mass.

Guaranteed composition; soluble phosphoric acid, 8 to 10 per cent.; potassium oxide, 4.5 to 5.5 per cent.; ammonia, 4 to 5 per cent. (equivalent to nitrogen 3.3 to 4.1 per cent.).

127. Bowker's Hill and Drill Phosphate. Collected of J. & J. A. Rice, Worcester, Mass., by State Inspector.

Guaranteed composition; soluble phosphoric acid, 8 to 10 per cent.; potassium oxide, 2 to 3 per cent.; ammonia, 2 to 3 per cent. (equivalent to nitrogen 1.6 to 2.5 per cent.

128. Standard Lawn Dressing, of Standard Fertilizer Co., Boston, Mass. Collected of Whittemore Bros., Boston. Mass.

No guarantee obtained.

	125	126	127	128
	POUNDS PER HUNDRED.			
Moisture at 100° C.,	9.72	10.15	16.95	16.00
Total phosphoric acid,	1.47	12.19	8.91	13.60
Soluble "	.12	4.80	7.39	9.88
Reverted "	.96	3.19	1.05	.06
Insoluble "	.39	4.20	.47	3.66
Potassium oxide,	1.11	4.48	1.29	2.66
Nitrogen,	1.35	3.78	2.32	2.34
Valuation per 2000 lbs.,	$9.42	$41.90	$30.27	$39.25

C. A. GOESSMANN, *Director*,

AMHERST, MASS.

J. E. Williams, Printer, Amherst, Mass.

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BULLETIN No. 6.

DECEMBER, 1883.

FODDER ANALYSES.

129. CORN MEAL.

From John L. Holley, South Amherst, Mass. Ninety-two per cent. passed through mesh 144 to the square inch.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	13.55	271.00			
Dry Matter, ...	86.45	1729.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	1.42	28.40			1 : 9.66
" Cellulose, ...	2.64	52.80	17.95	34.00	
" Fat, ...	4.24	84.80	64.45	76.00	
" Protein, (nitrogenous matter),	10.40	208.00	176.80	85.00	
Non-nitrogenous extract matter, . .	81.30	1626.00	1528.44	94.00	
	100.00	2000.00	1787.64		

The article is a fair specimen of its kind. As a more detailed discussion of the composition of corn may not be without some interest in this connection, I refer to the results of an examination of eleven prominent Eastern, Western and Southern varieties, which have been published in the annual report of the Mass. State Board of Agriculture for 1879. The samples of corn, which served for my investigation, were furnished by well-known parties; the mode of cultivation and of manuring was stated, and the material had been collected with care. The analytical work was carried on with a view of securing results of a strictly comparative value; they were stated with reference to a corresponding amount of moisture,—to render differences in composition prominent at sight. The actual demonstration of the influence of the particular condition of the soil on the feeding value of the same variety of corn raised upon it, (independent of varying quantity), deserves a serious consideration.

130. FODDER CORN. (1).

Sent on by Thomas J. Field, Northfield, Mass.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents	Nutritive Ratio.
Moisture at 100° C.,	6.65	133.00		Not ascertained by actual experiment.	
Dry Matter.	93.35	1867.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	4.68	93.60			
" Cellulose,	31.39	627.80			
" Fat,	1.42	28.40			
" Protein, (nitrogenous matter),	6.83	136.60			
Non-nitrogenous extract matter,	55.68	1113.60			
	100.00	2000.00			

131, FODDER CORN. (2).

(Frost bitten).

Sent on by Thomas J. Field, Northfield, Mass.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	6.67	133.40		Not ascertained by actual feeding experiments.	
Dry Matter, ...	93.33	1866.60			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	5.11	102.20			
" Cellulose, ...	33.75	675.00			
" Fat, ...	1.11	22.20			
" Protein, (nitrogenous matter),	6.17	123.40			
Non-nitrogenous extract matter, . .	53.86	1077.20			
	100.00	2000.00			

The history of the above samples of fodder corn, (130 and 131), as far as their respective stages of growth and their mode of cultivation, etc., is concerned, has not been reported.

The analytical results show some differences in composition in favor of No. 1, yet hardly enough under existing circumstances to encourage a discussion of the effects of frost in this particular case. The sample of frost bitten corn, after careful drying, proves still of a fair composition. The particular stage of growth and the character of the weather which follows the frost, exert a controling influence on the degree of changes in composition. The effects of frost are usually more serious in the earlier periods of the life of plants, than in their more matured state. Dry, cool weather after a frost causes less alteration in composition, than sultry, warm weather. Frost bitten green fodder corn is best preserved in silos.

132. WHEAT BRAN.

From John L. Holley, South Amherst, Mass.

Thirty-three per cent. passed through mesh 144 to square inch.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents	Nutritive Ratio.
Moisture at 100° C., ...	12.08	241.60			
Dry Matter, ...	87.92	1758.40			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	7.92	158.40			1 : 4.16
" Cellulose, ...	13.72	274.40	54.88	20.00	
" Fat, ...	3.81	76.20	60.96	80.00	
" Protein, (nitrogenous matter),	15.67	313.40	275.79	88.00	
Non-nitrogenous extract matter, . .	58.88	1177.60	942.08	80.00	
	100.00	2000.00	1333.71		

The article is of a good average quality.

133. COTTON SEED MEAL. (2).

Sent on by J. E. Soper & Co., of Boston.

Eighty-one per cent. passed through mesh 144 to square inch.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent of digestibility of constituents	Nutritive Ration.
Moisture at 100° C., ...	8.15	163.00			
Dry Matter, ...	91.85	1837.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	7.46	149.20			1 : 1.88
" Cellulose, ...	7.41	148.20	34.09	23.00	
" Fat, ...	14.72	294.40	267.90	91.00	
" Protein, (nitrogenous matter),	36.54	730.80	540.79	74.00	
Non-nitrogenous extract matter, . .	33.87	677.40	311.60	46 00	
	100.00	2000.00	1154.38		

This article has been obtained by the old (press) process. The sample, which served for analysis, No. 103, was of a better mechanical condition than No. 133.

A comparison of the composition of samples, No. 103 and No. 133, shows their differences to be due rather to the fact, that different lots of cotton seeds served for the production of the articles tested, than to a different process of grinding. The two modes of producing cotton seed meal ought to be tried on the same lot of seeds to render their respective merits conspicuous.

134. COTTON SEED MEAL.

From John L. Holley, South Amherst, Mass.

Eighty-nine per cent. passed through mesh 144 to square inch.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	8.38	167.60			
Dry Matter,	91.62	1832.40			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	8.51	170.20			1 : 1.41
" Cellulose,	6.73	134.60	30.82	23.00	
" Fat,	12.94	258.80	235.51	91.00	
" Protein (nitrogenous matter),	42.47	849.40	628.56	74.00	
Non-nitrogenous extract matter,	29.35	587.00	270.02	46.00	
	100.00	2000.00	1164.91		

A very good article as far as composition and mechanical condition are concerned.

135. COCOA DUST.

Refuse from Cocoa Manufacture, sent on from Boston, Mass.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	7.10	142.00		Not ascertained by actual feeding experiment.	
Dry Matter,	92.90	1858.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	6.83	136.60			
" Cellulose,	5.86	117.20			
" Fat,	25.85	517.00			
" Protein, (nitrogenous matter),	15.47	309.40			
Non-nitrogenous extract matter,	45.99	919.80			
	100.00	2000.00			

Essential mineral constituents in 100 parts of Cocoa dust.

Potassium oxide,	2.11
Calcium "	.63
Magnesium "	traces.
Phosphoric acid,	1.34

The material consisted of inside and outside parts of the cocoa bean with some foreign matter. It was obtained in the process of cracking and sifting the bean. The examination was made by request to ascertain its fitness for manuring. Although its nitrogen percentage (2.3 per cent.) compares well with many fertilizers in our market, it would be for economical consideration more advisable to try the cocoa dust as a fodder in place of oil bearing seeds. The reputation of the cocoa as a highly nutritive food for man is too well established to doubt the efficiency of the above described article as a fodder for some kind of farm stock.

FERTILIZER ANALYSES.

136. Sponge Refuse. Sent on from Albany, N. Y.

Moisture at 100° C.,	7.25	per cent.
Nitrogen,	2.43	“
Ferric oxide,	.17	“
Calcium oxide,	3.94	“
Magnesium oxide,	1.27	“
Phosphoric acid,	3.19	“
Insoluble matter,	39.05	“

137. Florida Marl. Sent on from Boston, Mass.

Moisture at 100° C.,	.60	per cent.
Calcium oxide,	41.75	“
Magnesium oxide,	1.03	“
Ferric oxide,	.36	“
Phosphoric acid,	2.72	“
Insoluble matter,	21.95	“

BONES.

138. Pure Dissolved Raw Bones. Sent on from Amherst, Mass.

Moisture at 100° C.,	10.23	per cent.
Total phosphoric acid,	16.03	“
Soluble “ “	7.76	“
Reverted “ “	3.83	“
Insoluble “ “	4.44	“
Nitrogen “ “	2.64	“

Valuation per 2000 lbs. $40.67

139. Dissolved Boneblack, of Bowker Fertilizer Co., Boston, Mass. Collected by State Inspector.

Guaranted composition; soluble phosphoric acid 12 to 13 per cent.

Moisture at 100° C.,	20.78	per cent.
Total phosphoric acid,	15.66	“
Soluble “ “	12.76	“
Insoluble “ “	2.90	“

Valuation per 2000 lbs., $31.55

140. Bone Fertilizer. Sent on by John Sanborn, Lawrence, Mass.

141. Pure Fine Ground Bones. Sent on from Amherst, Mass.

	140	*141*
	POUNDS PER HUNDRED.	
Moisture at 100° C.	4.25	5.27
Total Phosphoric Acid,	24.06	23.13
Soluble "	.76	.46
Reverted "	3.66	3.62
Insoluble "	19.64	19.05
Nitrogen,	2.88	3.73
Valuation per 2000 lbs.	$44.35	$46.82

142. Peruvian Guano. Collected of D. A. Horton, Northampton, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid 16 to 18 per cent.; potassium oxide 3 to 6 per cent.; ammonia 5 to 6 per cent. (equivalent to nitrogen 4.1 to 5 per cent.).

Moisture at 100° C.,	14.00 per cent.
Total phosphoric acid,	20.60 "
Soluble "	3.10 "
Reverted "	1.55 "
Insoluble "	15.95 "
Potassium oxide,	1.14 "
Nitrogen (in organic matter),	1.40 "
Nitrogen (in ammonia salts),	3.04 "
Valuation per 2000 lbs.	$51.66

AMMONIATED SUPERPHOSPHATES AND COMPLETE MANURES.

143. Mapes Tobacco Fertilizer. Collected of Fuller & Newton, Springfield, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid 7 to 7.5 per cent.; potassium oxide (in form of sulphate) 7 to 7.50 per cent.; ammonia 5.75 per cent. (equivalent to nitrogen 4.73 per cent.).

144. Stockbridge Manures. Peas and Beans, of Bowker Fertilizer Co., Boston, Mass. Collected of E. N. Wood, Lowell, Mass., by State Inspector.

Guaranteed composition; soluble phosphoric acid 8 to 10 per cent.; potassium oxide 2 to 3 per cent.; ammonia 3 to 4 per cent. (equivalent to nitrogen 2.5 to 3.3 per cent.).

145. Bowker's Grass Top Dressing. Forage Crops. Collected of J. C. Wright, Fitchburg, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid 6 to 8 per cent.; soluble and reverted phosphoric acid (available) 5 to 6 per cent.; potassium oxide 4 to 5 per cent.; nitrogen 4.25 to 5 per cent. (equivalent to ammonia 5 to 6 per cent.).

146. Haynes' Fertilizer, of Mr. Haynes, Bolton, Mass. Sent on by S. C. Damon, Lancaster, Mass.

No guarantee obtained.

	143	*144*	*145*	*146*
	POUNDS PER HUNDRED.			
Moisture at 100° C.,	15.18	17.10	10.38	17.63
Total phosphoric acid,	8.21	9.62	8.75	10.14
Soluble "	1.95	6.08	3.61	5.89
Reverted "	2.50	.84	1.29	.87
Insoluble "	3.76	2.70	3.85	3.38
Potassium oxide,	7.36	4.13	5.64	5.70
Nitrogen, (in organic matter),	.60	1.60	2.30	2.72
Nitrogen, (in ammonia salts),	2.43	.74	.44	.71
Nitrogen, (in nitrates),	1.70	.23	.93	.60
Valuation per 2000 lbs.,	$45.30	$33.60	$38.00	$41.85

147. Standard Superphosphate, of Standard Fertilizer Co., Boston, Mass. Collected of A. B. Lawrence, Fitchburg, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid 9 to 14 per cent.; potassium oxide 1 to 3 per cent.; ammonia 2 to 4 per cent. (equivalent to nitrogen 1.6 to 3.3 per cent.).

148. H. J. Baker & Bros.' A. A. Ammoniated Bone Superphosphate. Collected of Fuller & Newton, Springfield, Mass., by State Inspector.

Guaranteed composition; soluble and reverted phosphoric acid (available) 10 to 12 per cent.; potassium oxide 2 to 3 per cent.; ammonia 3 to 4 per cent. (equivalent to nitrogen 2.5 to 3.3 per cent.).

149. Bowker's Lawn-dressing. Collected of E. A. Thompson, Woburn, Mass., by Chemist of Station.

Guaranteed composition; total phosphoric acid 6 to 8 per cent.; soluble and reverted phosphoric acid (available) 5 to 6 per cent.; potassium oxide 4 to 5 per cent.; nitrogen 4 to 5 per cent. (equivalent to ammonia 4.5 to 5.5 per cent.).

150. Superphosphate, of Earle's Phosphate Co. Sent on from Dennisport, Mass.

No guarantee obtained.

	147	148	149	150
	POUNDS PER HUNDRED.			
Moisture at 100° C.,	18.08	12.11	5.33	9.48
Total phosphoric acid,	13.32	9.69	9.92	15.08
Soluble "	7.07	8.63	5.73	7.88
Reverted "	3.80	.27	1.93	.69
Insoluble "	2.46	.79	2.26	6.51
Potassium oxide,	1.43	2.38	5.52	2.34
Nitrogen, (in organic matter),	1.11	.65	1.19	2.91
Nitrogen, (in amonia salts),		2.23	3.28	
Nitrogen, (in nitrates),	1.49			
Valuation per 2000 lbs.,	$36.87	$36.98	$45.63	$41.64

151. Soluble Pacific Guano, of Pacific Guano Co., Boston, Mass. Collected of J. S. Clark & Son, Worcester, Mass., by State Inspector.

Guaranteed composition; soluble phosphoric acid 6½ to 8 per cent.; reverted phosphoric acid 1.6 to 3 per cent.; insoluble phosphoric acid 2 to 3 per cent.; potassium oxide 2 to 3.5 per cent.; nitrogen 2 to 3 per cent.

152. Stockbridge Manures. Grain. Collected of J. and J. A. Rice, Worcester, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid 7 to 9 per cent.; soluble and reverted phosphoric acid (available) 6 to 7 per cent.; potassium oxide 4 to 5 per cent.; nitrogen 3.25 to 4.25 per cent.

153. Soluble Pacific Guano. Collected of Parker & Gannet, Springfield, Mass., by State Inspector.

Guaranteed composition; soluble phosphoric acid 6.5 to 8 per cent.; reverted phosphoric acid 1.5 to 3 per cent.; insoluble phosphoric acid 2 to 4 per cent.; potassium oxide 2 to 3.5 per cent.; nitrogen 2 to 3 per cent.

154. Chittenden's Root Fertilizer, of National Fertilizer Co., Bridgeport, Conn. Collected of G. P. Smith, Sunderland, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid 8 to 10 per cent.; soluble and reverted phosphoric acid (available) 6 to 8 per cent.: potassium oxide 6 to 8 per cent.; ammonia 4 to 5 per cent. (equivalent to nitrogen 3.32 to 4.15 per cent.).

	151	*152*	*153*	*154*
	POUNDS PER HUNDRED.			
Moisture at 100° C.,	8.38	14.53	13.42	12.38
Total phosphoric acid,	13.07	8.75	11.74	8.57
Soluble "	6.87	2.91	5.11	5.34
Reverted "	1.17	2.14	1.15	1.91
Insoluble "	5.03	3.70	5.47	1.32
Potassium oxide,	1.60	5.33	2.05	6.68
Nitrogen, (in organic matter),	1.70	3.57	2.60	2.45
Nitrogen, (in nitrates),	.17	1.27	.17	.55
Valuation per 2000 lbs.,	$32.88	$40.29	$34.02	$35.66

155. Chittenden's Complete Manure. Grain, of National Fertilizer Co., Bridgeport, Conn. Collected of Geo. P. Smith, Sunderland, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid 8 to 10 per cent.; soluble and reverted phosphoric acid (available) 6 to 8 per cent.; potassium oxide 5 to 7 per cent.; ammonia 4.5 to 5.5 per cent equivalent to nitrogen 3.7 to 4.5 per cent.).

156. Standard Superphosphate, of Standard Fertilizer Co., Boston, Mass. Collected of E. N. Wood, Lowell, Mass., by State Inspector.

Guaranteed composition; total phosphoric acid 9 to 14 per cent.; potassium oxide 1 to 3 per cent.; ammonia 2 to 4 per cent. (equivalent to nitrogen 1.6 to 3.3 per cent.).

157. Bradley's Complete Manure. Corn and Grain. Collected of Breck & Son, Boston, Mass., by State Inspector.

Guaranteed composition; soluble phosphoric acid 6 to 8 per cent.; potassium oxide 4 to 5 per cent.; ammonia 4 to 5 per cent. (equivalent to nitrogen 3.3 to 4.1 per cent.).

158. Bradley's X L Ammoniated Bone Superphosphate. Collected of Garfield & Proctor, Fitchburg, Mass., by State Inspector.

Guaranteed composition; soluble phosphoric acid 7 to 8 per cent.; reverted phosphoric acid 2 to 3 per cent.; insoluble phosphoric acid 2 to 3 per cent.; potassium oxide 2 to 3 per cent.; nitrogen 2.5 to 3.5 per cent.

	155	*156*	*157*	*158*
	POUNDS PER HUNDRED.			
Moisture at 100° C.	12.90	20.75	8.60	15.97
Total phosphoric acid,	8.81	11.55	10.65	10.80
Soluble "	6.52	8.13	6.37	7.34
Reverted "	2.00	2.51	.88	.39
Insoluble, "	.29	.91	3.40	3.07
Potassium Oxide,	5.28	1.35	6 45	3.44
Nitrogen, (in organic matter),	2.79	2.17	4.51	2.44
Nitrogen, (in nitrates),	.38			
Valuation per 2000 lbs.,	$36.73	$34.13	$45.73	$34.59

C. A. GOESSMANN, *Director*,

AMHERST, MASS.

J. E. Williams, Printer, Amherst, Mass.

MASSACHUSETTS STATE
AGRICULTURAL EXPERIMENT STATION.

BULLETIN No. 7.

MARCH, *1884.*

Observations in Regard to Insects Injurious to the Apple.

159. In the growth of all kinds of farm or garden crops, the farmer and gardner find themselves forced to wage constant warfare with insects or parasitic plant life. In this paper we give the results of a few observations in regard to the *plum weevil*, or *Curculio* (*Conotrachelus nenuphar*), as affecting the apple crop, compared also with the *Codling Moth* and the *Apple Maggot.*

It has often been noticed early in the summer that apples nearly all fall from the trees when quite small. This was especially the case during the past season, and careful investigation were made to ascertain the cause. A tree of the variety known as the Westfield Seek-no-further, which blossomed very abundantly and set an unusually large crop of fruit, was selected. When from one half to one-inch in diameter, the fruit began to drop in large numbers so that not enough was left on the tree for one-half a crop. A large quantity of these were collected and examined, and out of eight hundred it was found that all but three were punctured by the plum curculio, leaving its peculiar crescent-shaped mark, and in every puncture was found an egg or small larva. The worm commonly found in the apple at this time have generally been supposed to be the larvæ of the *Codling Moth*, (*Carpocapsa pomonella*), yet in the number examined only four or five of the larvæ of the latter were found.

The remedies which have been successfully employed to prevent the injury of the plum crop by this larvæ are two, i. e., (1) that of jarring the trees and catching the insects and affected fruit in a sheet stretched on a frame or spread on the ground and destroying them, and (2) that of planting the trees in the limits of poultry yards. The first remedy cannot be applied to the apple tree on account of its size. The second has proved successful in saving the plum crop, and would undoubtedly be as successful with the apple, but the fowls should be numerous enough to not only catch the insects when they come from the ground, but also to let none of the larvæ escape when they come from the fallen fruit to go into the ground. Perhaps a more sure preventive would be, in addition to the above, to have the fruit destroyed by pasturing swine in the orchard in sufficient numbers to eat all of the fruit as soon as it drops.

The apple crop is also very much injured by the larvæ of the codling moth, mentioned above, which has been common for a long time, and the *Apple Maggot*, (*Tripeta pomonella*), which has only done serious damage within the past five years. The latter injures the fruit by making burrows in the flesh, many larvæ or maggots often working in the same apple.

The eggs are laid by a small fly somewhat resembling the common house fly—but not more than one-half its size—through a small opening in the skin of the apple made with its ovipositor. It shows especial liking for the thin-skinned, mild, sub-acid or sweet summer or autumn varieties, but also attacks some winter varieties.

Its ravages have become so extensive in some localities that prompt measures must be taken for its extermination or it may work the total destruction of the apple crop.

The practice of pasturing swine in the summer is being recommended, and practiced by many of our leading farmers and stock-breeders and the orchardist, must combine to a certain extent this branch of business with his own if he would be successful, for the destruction of the fruit as it falls from the tree is the only *safe* and *sure* remedy now known to prevent injury by these three insects.

S. T. MAYNARD,
Professor of Botany and Horticulture,
Massachusetts Agricultural College.

Experiments with Special Fertilizers in Fruit Culture.

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160. CURRANTS AND PEACHES.

The experiments with *Currants*, which are described in the subsequent communication, are but a continuation of an investigation inaugurated upon the college grounds ten years ago. Field experiments with sugar beets, for the purpose of ascertaining the influence of special fertilizers on the saccharine qualities, and the general character of the roots raised by their assistance, suggested the extension of the inquiry to fruit-bearing plants. For the sake of brevity, and of a desirable understanding of the points involved, I reproduce here the introduction of one of the first publications on the subject under discussion: "The question whether a systematic and rational manuring of our fruit-bearing plants is essential for the continued production of good crops, engages more attention from year to year. Judging merely from the results obtained in general farm management, in consequence of the adoption of the rule to restore annually to the soil under cultivation either the entire amount or in part as circumstances may advise those of its constituents which the crops carried off have abstracted, it seems but reasonable to assume that the same principle applied to the cultivation of fruits and garden crops in general, must prove in the end most advantageous as far as quality and quantity of the crops resulting are concerned. A liberal supply in particular of those essential elements of plant food which are found in the fruits in conspicuous quantities, and for obvious reasons must serve important functions in their growth if judiciously provided, cannot otherwise but prove beneficial to the entire plant. To secure that amount in a more definite form, than as a general rule, has been customary, improves most decidedly our chances to ascertain not only the special wants of the plants under cultivation, but to recognize also the particular form in which the various elements of plant food exert their most valuable influence on the quality of the crops. Believing in the correctness of these views, I entered a few years ago upon a series of analytical chemical inquiries to determine the character of the ash constituents of fruits, and to study also the relations which apparently exist between the variations in the composition of the former, and the quality of the latter, for the purpose of furnishing information needed for the *successful* introduction of a *rational system* of *fertilization* of our *fruit-bearing plants.*"

These investigations have been carried on since without serious interruption, as far as the limited resources of past years for experimental work of that character have permitted. The scarcity of previous systematic chemical inquiries into the relations existing between the kind and the amount of available plant food in a productive garden soil or orchard, and the absolute and relative quantity of the various soil constituents contained in the fruits and the garden crops raised upon it, rendered it necessary to grow them under well defined circumstances, to obtain material fit for comparative analyses. The necessity of adopting that course of action became still more apparent, when considering the extraordinary influence—quite generally conceded—of soil, location and season on the quality of these crops. Products raised by the aid of different manurial substances, within the *same season*, upon a *similar soil*, and of a *corresponding stage* of *growth*, had to be secured for the examination, to impart a scientific and practical value to the analytical results.

It is a well-known fact that the *absolute amount* of the mineral constituents of plants of the same variety and of one and the same species even may differ widely, yet as a rule this circumstance does not necessarily alter the general character of the plants. A change, however, in the *relative proportion* of the various mineral constituents, as potassa, lime, etc., rarely has been noticed without having affected the quantity of some of the organic constituents, as sugar, starch, acids, etc. The fact that the essential mineral constituents (potassium, calcium, magnesium, iron and phosphorus), of our farm plants cannot replace each other beyond a certain extent in the vegetable economy without endangering their life, points towards a *specific* function of each of them in the growth of these plants. We have learned by experimental observation what elements are indispensable for a healthy growth, and a successful reproduction of these plants. It remains for us then to ascertain the particular function of each of the above elements in the life of plants. The more we learn of the specific functions of each essential mineral constituent of plants, the better will we be prepared to perfect our system of manuring, to cultivate with a view of developing desirable qualities in the crops, and to counteract the serious influences of an abnormal composition of the sap, on the life of plants.

To secure suitable material for an examination in the above mentioned direction, five experimental plats were set apart for that purpose, in 1875. They were planted under the direction of Prof. Maynard, with strawberries, raspberries, currants, and blackberries, besides cherry, plum, pear and apple trees. Four of these plats received annually, a certain kind and amount of chemical manure, (see currant experiments below), while one plat received no manure. Upon each plat were planted the same kind and variety of fruits. Some interesting observations made on grapevines and strawberries have already been published in the annual reports of the college, in the Report of the Mass. State Board of Agriculture for 1879, and elsewhere. A brief description of experiments with healthy peach trees, and with trees suffering with "the Yellows," has been published in the reports of the Mass. Horticultural Society, and of the State Board of Agriculture for 1882. A more detailed description of these experiments in particular, will be found in the annual report of the Board of Control of the State Experiment Station for 1883. The experiments with currants below described, furnish an interesting addition to previous observations.

EXPERIMENTS WITH CURRANTS.

RED CURRANTS (VERSAILLES).

The plants furnishing the fruits for the examination had been for several years under special treatment upon five different experimental plats. The ground upon which these plats are located has served for years previous to its present use, for the production of grass. The soil consists of a light gravelly loam. Each plat covers an area of 4,200 square feet; four of them have received annually for five to six years past a definite amount and kind of special chemical manure, while one plat received none. The fertilizer was applied broadcast early in the spring, and subsequently incorporated in the soil by means of a cultivator. The plats were otherwise treated alike to secure a good mechanical condition of the soil, and to keep off the weeds.

FERTILIZERS APPLIED.

Plat I received annually forty-five pounds of dissolved boneblack containing from 10 to 12 per cent. of soluble phosphoric acid, and fifteen pounds of potash nitre (saltpeter).

Plat II received annually fifteen pounds of potash nitre, and thirty pounds of Kieserit (sulphate of magnesium).

Plat III received annually forty-five pounds of dissolved boneblack, fifteen pounds of potash nitre, and thirty pounds of Kieserit.

Plat IV nothing applied.

Plat V received annually forty-five pounds of dissolved boneblack, eighteen pounds nitrate of soda (Chili saltpeter), and fifteen pounds of muriate of potash.

Nitrogen was applied in form of nitric acid to secure a uniform action of that element.

Well matured fruits were in every instance secured for the tests. They were collected July 18th, 1883, and examined without delay.

One hundred parts by weight of the berries contained:

	I	II	III	IV	V
Dry vegetable matter,	13.76	13.61	15.72	12.95	13.86
Water at 100° C.,	86.24	86.39	84.28	87.05	86.14
Ash in dry matter,	0.45	0.45	0.48	0.41	0.45

An examination of the composition of the berries showed the highest color, the largest amount of vegetable matter, and the largest amount of mineral constituents in the fruits from plat three; the fruits from plat five rank next in regard to these qualities, yet exceed in sugar by more than one per cent. The fruits from plat four (without fertilizer), rank lowest in quality. The examination of the organic constituents of the berries will be repeated during the coming seeson, when more details will be published.

ASH ANALYSIS OF FRUIT WITH STEMS.

PLATS.	I.	II.	III.	IV.	V.
Sesqui oxide of iron,	1.84	.99	.95	1.20	.75
Potassium oxide,	54.35	56.12	54.32	47.68	59.34
Sodium oxide,	5.42	2.35	2.56	4.02	4.04
Magnesium oxide,	4.10	5.08	5.49	6.23	4.61
Calcium oxide,	15.96	17.21	17.68	18.96	14.69
Phosphoric acid,	18.33	18.25	19.00	21.91	16.57
	100.00	100.00	100.00	100.00	100.00

The results of the ash analyses of the currants are calculated and reported with reference only to the several constituents mentioned in the above statement, for the purpose of rendering the variations in their quantitative relations more conspicuous. Other ash constituents as sulphur, chlorine, and silica are for the present for various reasons excluded from the discussion. A careful consideration of the composition of the ash obtained from fruits raised upon the *unfertilized* plat (IV), as compared with any of those obtained from fruits raised upon the *fertilized* plats, cannot fail to lead to the conclusion that the unfertilized soil contained an ample supply of available phosphoric acid, magnesia, soda, and iron; for even an actual addition of these important plant constituents in the form of fertilizer to the soil of plats I, III and V, failed to increase the quantity of these constituents above that found in the ash of fruits raised upon the unfertilized plat. The only ash constituent in which the unfertilized soil seems apparently to have been deficient, is available potassa.

An addition of potash compounds to the soil has in every instance increased the percentage of potassa in the fruits, varying from six to eleven and more per cent. The fruit gathered from plat five showed the most remarkable difference in that direction. Potash fertilizers have decidedly improved desirable qualities in the fruits; those from plat five proved the most saccharine.

Aside from the practical lessons which may be gleaned from the above described experiment, there is another feature of the analytical results deserving a serious consideration,—namely the *increase* of *potassa* in the currants is invariably accompanied by a *corresponding decrease* of phosphoric acid, and of *lime* in particular. This result coincides with my previous observations, concerning the action of potash fertilizers on grapes, strawberries and peaches. The circumstance that the most striking alterations in the mineral constituents of the currants has been produced by muriate of potash, seems to be of particular interest in connection with some of my previous experiments, regarding the effects of that potash compound on *diseased peach trees.*

The examinations of fruits and of young branches from peach trees affected by

"THE YELLOWS"

disclosed the fact that they contained a larger amount of lime and more phosphoric acid than fruits and young branches collected from healthy peach trees of the same variety. This condition of diseased peach trees has since been recognized by Dr. R. C. Kedzie,—on trees raised in Michigan—in a letter to J. P. Leland, published Jan. 29th, 1884, in the Allegan *Gazette.*

It was also found in our experiments that a repeated application of muriate of potash in connection with a judicious pruning, restored the affected trees to a vigorous growth, and the new branches and fruit to a normal amount of potassa, lime and phosphoric acid. The excess of lime disappeared in both fruit and branches, and the trees are reported by Prof. Maynard, as restored to a healthy bearing condition.

The observation on currants (plat V) furnishes an additional illustration of the beneficial effect claimed by me for the muriate of potash. The importance of the interests involved, renders a fair trial desirable elsewhere. The details of the mode of operation are published in the forthcoming annual report of the Board of Control of the Experiment Station for 1883. The Director of the Station asks to be favored with information, regarding the results obtained.

GARDEN CROPS.

161. ASPARAGUS.

	Stems.	*Roots.*
Moisture at 100° C.,	5.53	4.85
Dry matter,	94.47	95.15
Nitrogen in dry matter,	1.98	1.48
Insol. in acids,	0.08	3.67

One hundred parts of crude ash contained:

	Stems.	*Roots.*
Potasssium oxide,	42.94	56.43
Sodium oxide,	3.58	5.42
Calcium oxide,	27.18	15.48
Magnesium oxide,	12.77	7.57
Phosphoric acid,	12.31	15.09
Sesquioxide of iron,	1.22	not determined.

The examination has been carried on at the especial request of several garden farmers in the eastern part of the state. The plants, serving for the analysis, were raised upon the college grounds, upon a light loamy soil, which previously had been occupied by grasses. The comparatively small amount of soda in the ashes of both stems and roots confirms the impression that the beneficial influence of common salt on asparagus beds not unfrequently reported, is due rather to its action on the physical condition of the soil, than to its requirement as plant food. The common salt increases the hydroscopic quality of the soil, assists in the diffusion of potassa, and phosphoric acid, and rarely supplies deficiencies in the soil, as far as its own constituents are concerned. A judicious application of muriate of potash, with sulphate of magnesia (Kieserit) tends to secure available potash throughout the entire body of the soil, penetrated by the extensive root mass of the plants.

162. ONIONS.

Samples collected on the college grounds.

One hundred parts of air dry onions without leaves contained:

Moisture at 100° C.,	89.200
Dry matter,	10.800
Nitrogen in dry matter,	0.212
Sulphur " "	0.048
Crude ash, " "	0.436

One hundred parts of ash contained:

Potassium oxide,	38.51
Sodium oxide,	1.90
Calcium oxide,	8.20
Magnesium oxide,	3.65
Sesquioxide of iron,	0.58
Silicic acid,	3.33
Phosphoric acid,	15.80

The analysis of onions was made some time ago, and is published here to meet inquiries of parties interested in the cultivation of this crop. The entire amount of sulphur present has been stated as sulphuric acid in the subsequent calculation of a crop per acre.

A calculation of the previously specified analytical results shows, that from four hundred and forty-one, to four hundred and forty-two bushels, of fifty-two pounds each, of onions in an air dry fresh state, contained:

Potassium oxide,	38.51	pounds
Sodium oxide,	1.90	"
Magnesium oxide,	3.60	"
Calcium oxide,	8.20	"
Sesquioxide iron,	0.58	"
Silicic acid,	3.33	"
Phosphoric acid,	15.80	"
Sulphuric acid,	29.81	"
Nitrogen,	48.63	"

FERTILIZER ANALYSES.

The fertilizers presented in this bulletin are valued on the basis of the prices of the past year, the samples being collected towards the close of the year. The rates for the valuation of fertilizers for the present year, will be published in the next bulletin. The annual collection of samples begins towards the close of the present month, n order to secure material from new stock.

TOBACCO STEMS.

163. Connecticut Valley tobacco. Sent on by E. S. Warner, Hatfield, Mass.

164. Havanna tobacco. Sent on by S. G. Hubbard, Hatfield, Mass.

	163	*164*
Moisture at 100° C.,	8.95	11.05
Dry matter,	91.05	88.95
Crude ash,	13.91	13.30
Nitrogen in dry matter,	2.69	2.91

One hundred parts of dry matter contained:

Potassium oxide,	6.21	3.76
Sodium oxide,	0.68	0.20
Calcium oxide,	4.76	4.15
Magnesium oxide,	1.14	1.53
Phosphoric acid,	0.87	0.50
Sesqui oxide iron,	not determined.	0.16
Valuation per ton of 2,000 pounds for fertiltzing purposes.	$16.00	$14.28

Analysis 163 is republished from last year's report for the purpose of enabling a comparison of the composition of the refuse stems of the entire tobacco plant of the Connecticut Valley with that of the leaf-stems of Havana tobacco, 164. The valuation is based on the prices of the past year;—it is safe to count one-tenth less, at the prices of the present year.

165. RAW CUBA GUANO.

Sent on from Boston, Mass.

166. DRIED CUBA GUANO.

Sent on from Boston, Mass.

	165		*166*	
Moisture at 100° C.,	36.57	per cent.	22.57	per cent.
Total phosphoric acid,	11.34	“	13.73	“
Soluble phosphoric acid,	.89	“	1.06	“
Reverted phosphoric acid,	3.52	“	4.45	“
Insoluble phosphoric acid,	6.93	“	8.22	“
Potassium oxide,	.94	“	1.20	“
Nitrogen (in organic matter),	.87	“	1.48	“
Nitrogen (in ammonia salts),	.14	“	.26	“
Nitrogen (in nitrates),	.64	“	1.00	“
Valuation per 2000 lbs.,	$24.00		$34.49	

167. AMERICO A 1 PERUVIAN GUANO.

Sent on by J. C. Cozzen, Swansea, Mass.

No guarantee obtained.

Moisture at 100° C.,	8.35	per cent.
Total phosphoric acid,	10.03	“
Soluble “	2.99	“
Reverted “	1.72	“
Insoluble “	5.32	“
Potassium oxide,	3.84	“
Nitrogen,	5.62	“
Valuation per 2000 lbs.,	$44.82	

168. The Economical Fertilizer, of Baugh & Sons, Philadelphia, Pa. Sent on by Sec. of Mass. State Board of Agriculture.

Guaranteed composition; soluble and reverted phosphoric acid (available) 5 to 6 per cent.; sulphate of potash, 4 to 5 per cent.; ammonia, 2 to 2½ per cent., (equivalent to nitrogen 1.6 to 2. per cent.).

169. Baugh's Double Eagle Phosphate. Sent on by Sec. of State Board of Agriculture.

Guaranteed composition; soluble and reverted phosphoric acid (available) 5 to 6 per cent.; ammonia, 2 to 2½ per cent., (equivalent to nitrogen 1.6 to 2. per cent.).

170. Clark's Cove Guano, of Clark's Cove Guano Co., New Bedford, Mass. Collected of E. S. Snow, Belchertown, Mass., by Chemist of Station.

No guarantee obtained.

171. Ames Bone Fertilizer, of A. L. Ames, Peabody, Mass. Collected at Danvers, Mass., by Chemist of Station.

No guarantee obtained.

	168	*169*	*170*	*171*
	POUNDS PER HUNDRED.			
Moisture at 100° C.,	8.10	7.23	22.95	12.38
Total phosphoric acid,	8.68	8.86	8.38	16.41
Soluble "	3.13	4.49	6.39	4.60
Reverted "	.88	1.18	.07	7.38
Insoluble "	4.67	3.19	1.92	4.43
Potassium oxide,	2.31		2.30	.75
Nitrogen, (in organic matter),	2.74	2.20	.76	2.75
Nitrogen, (in ammonia salts),			1.14	
Nitrogen, (in nitrates),			.29	
Valuation per 2000 lbs.,	$29.73	$25.72	$29.02	$40.54

C. A. GOESSMANN, *Director*,

AMHERST, MASS.

J. E. Williams, Printer, Amherst, Mass.

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MASSACHUSETTS STATE

AGRICULTURAL EXPERIMENT STATION.

BULLETIN No. 8.

APRIL, 1884.

FODDER AND FODDER ANALYSES.

The Experiment Station has entered in its first year of existence, upon a systematic course of experiments to assist in determining the influence of stage of growth and mode of cultivation on the comparative feeding value of some of our prominent farm crops. The results thus far published, although essentially of local interest, deserve more than a passing notice, on account of the scarcity of examinations of a similar character of forage crops raised under quite common circumstances within the limits of the State. The significance of the various analytical results will become more apparent, as the work progresses. As the character of the soil and its state of fertility ought to be better known before a more detailed discussion of the connection between soil, season and composition of the crop can be considered profitable, a mere record of the progress of the analytical work is all that can be consistently published at the present stage of the investigation. Aside from the trials with some of our standard forage crops there have been also inaugurated experiments with the cultivation of reputed forage crops of other localities and countries, to test their adaptability to our soil and climate. The successful introduction of a greater variety of valuable fodder crops, promises to furnish a wider range of fodder-substances, as far as their nutritive value is concerned, a circumstance not less acceptable to our agricultural industry, than it has proved elsewhere. The best interests of the dairy business call for an efficient protection against the serious influences of drought, during past years, on the yield of meadows and pastures. The cultivation of fodder crops, growing upon different kinds of soil, and maturing at different periods of the season, have proved of valuable assistance in that direction. Some of the results of our trials with cow pea, serradella, vetch, etc., will be reported within a few subsequent papers.

172. COW PEA.

Dolichos (sinensis?) ; var. Clay.

From Experimental Plats of Station ; collected August 1, 1883.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	9.30	186 00			
Dry Matter,	90.70	1814.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	9.53	190.60			1 : 4.75
" Cellulose,	23.58	471.60	221.65	47	
" Fat,	3.81	76.20	44.96	59	
" Protein, (nitrogenous matter),	17.02	340.40	204.24	60	
Non-nitrogenous extract matter,	46.06	921.20	635.63	69	
	100.00	2000.00	1106.48		

The seeds for these experiments were obtained through the kindness of Dr. Dabney, Director of the State Experiment Station of North Carolina. The rates of digestibility of the various constituents of the hay of the cow pea, above stated, are those of clover hay—a fodder substance of a similar character. The "Clay" variety of the cow pea is considered the best of the many varieties raised in the Southern States. The merits of this plant are described by a farmer of North Carolina,* in the following words: "It has no tendrils, but twines like beans, or runs upon its own foliage. It is of rapid growth, making in three months on ordinary land, an almost impenetrable mass of foliage two feet high, and so very dense that it destroys all other vegetation, even the thistle, ragweed, and other noxious plants. When well cured these vines are simply invaluable for hay, and worth as ascertained by actual experiments, thirty-three to fifty per cent. more than timothy. The only difficulty in making them the leading crop for hay, is that it takes three days to cure them. Cattle and horses prefer such hay to the best of herds-grass, and even to corn. Pea vines are the best fertilizer we can use, decomposing very rapidly. I have frequently cut off the vines before they began to run (July 1), and by August the roots would throw out new vines two feet long. The seed sold in May for seventy-five cents per bushel."

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*See Report of North Carolina Experiment Station for 1879, page 111.

The experimental plats were seeded down towards the latter part of May, and produced a handsome dense foliaceous growth about 18 inches high at the beginning of August, when the samples for analysis were collected. The early frost in September injured the crop. The plant apparently deserves the importance claimed for it in the above stated report. Its cultivation has proved a success in New Jersey. The only objection which might be raised against its introduction consists in the circumstance that matured seeds cannot be relied on in our section of the country. As green fodder it compares well with clover, and most likely would produce a valuable ensilage.

173. COW PEA.

Var.: Whippoorwill.

From Experimental Plats of Station; collected August 1, 1883.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	9.65	193.00			
Dry Matter,	90.35	1807.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					1:4.74
Crude Ash,	10.46	209.20			
" Cellulose,	22.36	447.20	210.18	47	
" Fat,	3.87	77.40	45.67	59	
" Protein (nitrogenous matter),	16.95	339.00	203.40	60	
Non-nitrogenous extract matter,	46.36	927.20	639.77	69	
	100.00	2000.00	1099.02		

This variety is described as making but little vine, and is considered less valuable than the "Clay" variety. It made a dense foliaceous growth fully equal to latter in size. Neither of them produced seeds.

174. COW PEA.

Var.: Whippoorwill.

Raised on plats of Station, as mixed crop, with oats. Collected August 1, 1883.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ration.
Moisture at 100° C.,	9.75	195.00			
Dry Matter,	90.25	1805.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	7.87	157.40			1 : 4.95
" Cellulose,	19.06	381.20	179.16	47	
" Fat,	4.49	89.80	52.98	59	
" Protein, (nitrogenous matter),	17.17	343.40	206.04	60	
Non-nitrogenous extract matter,	51.41	1028.20	709.46	69	
	100.00	2000.00	1147.64		

The analysis was made from the pea vines, raised with the oats; the analysis of the latter has been reported in Bulletin 5, (No. 102). This course of separate analysis was adopted on account of the uneven distribution of both plants. The mixed crop was on the first of August in excellent condition for green fodder or hay. An experiment with rye failed on account of a bad quality of rye. Assuming the mixed crop of peas and oats to consist of three times as much oats as peas, the nutritive ratio of the mixture would be 1 : 12. In case of two parts of oats and one of cow peas, the ratio would be 1 : 10, and in of even quantities of both plants, the ratio would be 1 : 8.7. Raised in connection with rye, the nutritive value of the mixed crop would be still higher. Within three months time a fodder can be raised fully equal if not decidedly superior in nutritive value to our best English grasses.

VALUATION OF FERTILIZERS

—AND—

ANALYSES OF FERTILIZERS.

PRICES OF NITROGEN, PHOSPHORIC ACID, AND POTASH.

The prices to be used in computing values of Commercial Fertilizers for the year 1884, are given in this bulletin. They are approved at the experiment stations of Connecticut, Massachusetts, and New Jersey, and furnish a uniform basis for comparisons of cost and commercial values of different brands offered in market, when their analyses are known.

TRADE VALUES OF FERTILIZING INGREDIENTS IN RAW MATERIALS AND CHEMICALS.

	CENTS PER POUND.			
	1881	1882	1883	1884
Nitrogen in Ammonia Salts,	22½	29	26	22
" Nitrates,	26	26	20	18
" Dried and fine ground fish,	20	24	23	20
Organic nitrogen in guano and fine ground blood and meat,	20	24	23	18
Organic nitrogen in cotton seed, linseed meal, and in castor pomace,	16	18	18	18
Organic nitrogen in fine ground bone,	15	17	17	18
Organic nitrogen in fine medium bone,	14	15	15	16
Organic nitrogen in medium bone,	13	14	14	14
Organic nitrogen in coarse medium bone,	12	13	13	12
Organic nitrogen in coarse bone, horn shavings, hair, and fish scraps,	11	11	11	10
Phosphoric acid soluble in water,	12½	12½	11	10
" " " ammonia citrate,*	9	9	8	9
Phosphoric acid insoluble in dry fine ground fish, and in fine bone,	6	6	6	6
Phosphoric acid insoluble in fine medium bone,	5½	5½	5½	5½
Phosphoric acid insoluble in medium bone,	5	5	5	5
" " " coarse med. "	4½	4½	4½	4½
" " " " "	4	4	4	4
" " " fine ground rock phosphate,	3½	3	2¾	2¼
Potash as high grade sulphate,	7½	7	7	7¼
" Kainite,	5½	5	4¼	4¼
" Muriate,	4½	5	4¼	4¼

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*Dissolved from two grams of Phosphate, unground, by 100 C. C. neutral solution of ammonium citrate sp. gr. 1.09 in 30 minutes at 40 deg. C., with agitation once in five minutes; commonly called "reverted" or "backgone" phosphoric acid.

The above trade values are the figures at which on March 1st, the respective ingredients could be bought at retail, for cash in our markets in the *raw materials*, which are the regular source of supply. They also correspond to the average wholesale prices for the six months ending March 1st, plus about 20 per cent. in case of goods for which we have wholesale quotations. The calculated values obtained by the use of the above figures, will be found to agree fairly with the reasonable retail price in case of standard raw materials, such as:

Sulphate of Ammonia,
Nitrate of Soda,
Muriate of Potash,
Sulphate of Potash,
Dried Blood,
Azotin,
Dry Ground Fish,
Cotton Seed,
Castor Pomace,
Bone
Plain Superphosphates.

TRADE VALUES IN SUPERPHOSPHATES, SPECIAL MANURES AND MIXED FERTILIZERS OF HIGH GRADE.

The organic nitrogen in these classes of goods will be reckoned at the highest figure laid down in the Trade Values of Fertilizing Ingredients in Raw Materials, namely, twenty cents per pound.

Insoluble phosphoric acid will be reckoned at four and one-half (4½) cents, the cost of phosphoric acid in coarse medium bones. Potash at four and one-quarter cents, if sufficient chlorine is present in the fertilizer to combine with it. If there is more potash present than will combine with chlorine, then this excess of potash will be reckoned as sulphates.

The use of the highest trade values, is but justice to those articles in which the costliest materials are used. In most cases the calculated value of superphosphates and specials will fall considerably below the retail price. The difference between the two will represent the manufacturer's expenses in converting raw materials into the manufactured articles.

These expenses include grinding and mixing, bagging or barreling, storage and transportation, commission to agents or dealers, long credit, interest on investment, bad debts, and finally profits.

Last year the selling price of the superphosphates and specials was on the average fifteen per cent. greater than the Station valuations, or thirty-five per cent. in advance of the wholesale cost of the fertilizing elements in the raw materials.

The average cost of Ammoniated Superphosphates and Guano was about $41.50, the average estimated value was about $35.00, and the difference $6.50.

In case of specials, average cost was $50.00, average valuation $42.50, difference $7.50.

It has been the aim in previous bulletins of the Station to describe briefly in connection with analytical reports regarding their composition, the peculiar character and the special merits of prominent agricultural chemicals, and of refuse materials of various industries which are commonly used for the manufacture of compound fertilizers for farm purposes.

This feature of the bulletins will be retained for the future, wherever an inducement is offered. The information thus far given on these occasions may be improved by studying the official annual reports on Commercial Fertilizers published for ten years past, in the Reports of the Mass. State Board of Agriculture. A knowledge of the sources and of the character of the ingredients which serve largely for the manufacture of our commercial fertilizers, leads quite naturally to a due appreciation of the importance of securing *the proper form* for our circumstances. No mode of supplying our special wants of plant food for a successful and economical cultivation of crops is as safe, as the practice to supplement—if needed—our home-made manures with commercial fertilizing ingredients in the form of suitable raw materials and chemicals to meet our wants; and if obliged to increase our home resources of manure, to compound them from the most suitable stock in the market. Although a first trial of that course of action may not realize all the advantages expected, there can be no doubt about the correctness of the statement, that the best financial success on the part of the farmer can only be secured by the gradual adoption of that system of manuring the farm.

Our leading dealers in fertilizers begin to realize the late tendency in their trade, and are preparing to meet the call. There is every reason to assume that the consumption of commercial manurial matter will increase in the same proportion, as the principles of a rational and economical system of manuring becomes better understood.

175. THE PHŒNIX FRUIT TREE INVIGORATOR.

Manufactured by the Phœnix Fruit Tree Invigorator Co., of
Livonia, Livingston Co., N. Y.

"A specific for the Aphis on Fruit Trees and Berry Bushes of all kinds."

"PATENT SECURED."

Sent on for examination by the Editor of the *New England Homestead*, Springfield, Mass.

One hundred parts of the material contained:

Moisture at 100° C.,	21.75
Sulphur free,	41.25
Sulphur combined (with alkalies),	1.66
Sulphuric acid,	0.64
Phosphoric acid,	0.82
Chlorine,	0.20
Carbonic acid,	9.54
Ferric oxide,	0.68
Magnesium oxide,	1.13
Potassium oxide,	3.34
Calcium oxide,	14.08
Small quantities of soda with coal, etc.,	2.07
Ash constituents insoluble in acid,	2.84
	100.00

CLAIMS OF THE MANUFACTURER.

"This compound when applied to plants or trees, is taken up by the circulation of the sap, and carried by it to the leaves, where it is reorganized and distributed to all parts of the tree, giving the tree a healthy leaf, and a vigorous growth. Price per pound box, $1.50."

DIRECTIONS GIVEN BY THE MANUFACTURER FOR USE.

"For Fruit Trees. Bore into the trunk of the tree near the ground with $\frac{5}{8}$ bit till the heart is nearly reached; and fill the opening with the Phœnix Fruit Tree Invigorator, and close tight with a thin cork or grafting wax. A wooden stopper may be used. Apply any time during the winter and spring, till the first of June.

"For Berry, Currant, Rose Bushes and House Plants. Remove the dirt and rough bark from the roots, and apply the invigorator, covering again with dirt."

The mode of applying the offered remedy for the destruction of insect life, and for the promotion of a healthful growth of plants, requires certainly a serious operation, and a first trial if at all contemplated, ought to be carried out on a limited scale. The proposition to introduce the remedy directly into the circulation of the plant, is not without its analogy in the treatment of animals. One point, however, must be cheerfully conceded—the patentee means to get a liberal pecuniary compensation for his claimed discovery.

A mixture of an essentially corresponding composition, may be produced at an expense of from 12 to 15 cents per pound, at retail cost, by taking from 40–42 lbs. of flour of sulphur, and 58–60 lbs. of sifted wood ash.

176-177. SALT MUD.

Sent on by L. B. Goodwin, So. Duxbury, Mass.

I. Sample taken from a dock dug in a salt marsh. The sender states that large quantities of kelp have been unloaded at this dock, and a good deal of ell-grass is also deposited.

II. Taken from the flats at low water mark.

	I.	II.
Moisture at 100° C.,	46.36	60.37
Ash constituents,	49.28	33.09
Insoluble in acids,	43.55	26.20
Nitrogen in organic matter,	0.39	0.40

Soluble constituents contained:

	I.	II.
Sesqui oxide of iron,	4.55	3.70
Calcium oxide,	0.66	0.90
Magnesium oxide,	0.31	0.43
Potassium oxide,	0.33	0.32
Sodium oxide,	0.94	1.21
Phosphoric acid,	traces.	traces.

178. BLACK MUD.

From the flats near Weymouth, Mass.

Sent on by Thomas A. Watson, Esq.

Moisture at 100° C.,	56.55
Ash constituents,	39.60
Insoluble in acids,	31.84
Nitrogen in organic matter,	0.30

Soluble constituents contained:

Sesqui oxide of iron,	4.26
Calcium oxide,	0.91
Magnesium oxide,	0.66
Potassium oxide,	0.38
Sodium oxide,	0.86
Phosphoric acid,	traces.

These three deposits of tidal water are of a similar composition. The amount of organic matter present does not exceed seven per cent.; and the soluble mineral substances are mainly those found in the water of the ocean. The commercial value of plant constituents amounts at present rates per ton of the deposits, in none of them to more than $1.75; in the last named sample still less.

For those interested in the composition of the fertilizing material deposited and collected along the seashore, the following references are given:

Kelp and *Rockweed*. See Report of State Board of Agriculture 1878–79; page 347.

Rockweed and *Musselmud*. Rep. 1879–80; page 338—339.

Eelgrass. Rep. 1882–83; page 407.

179. FRESH WATER MUD.

(Little Pond at South Braintree.)

Sent on by A. Drew, Esq., Boston, Mass.

Analysis of a fairly dried samples:

Moisture at 100° C.,	40.37
Calcium oxide,	1.27
Magnesium oxide,	0.29
Potassium oxide,	0.22
Ferric oxide,	1.80
Phosphoric acid,	.26
Nitrogen,	1.37
Insoluble matter,	18.26

The material in its natural state contains 72 per cent. water; in its composition it resembles a fibrous peat; yet it is less humified, and will yield its nitrogen, etc., more readily. One ton of the analyzed material represents a commercial value of from 5 to 6 dollars.

180. WESTERN ASHES.

(Leached.)

Sent on from Hingham, Mass., by Edmund Hersey, for the Hingham Agricultural and Horticultural Society.

Moisture at 100° C.,	24.53
Calcium oxide,	26.53
Magnesium oxide,	3.03
Potassium oxide,	0.79
Phosphoric acid,	1.89
Insol. matter, before Calcination,	21.71

The composition of this sample of leached ashes resembles closely that of a previously reported one from Detroit, Mich. (See Bulletin 5, No. 108).

181. GARDEN FERTILIZER.

Sent on by farmers from Somerset, Mass.

Moisture at 100° C.	6.64
Soluble phosphoric acid,	0.70
Reverted " "	2.12
Insoluble " "	8.26
Total phosphoric acid,	11.08
Potassium oxide,	11.42
Nitrogen,	4.28
Insoluble matter,	0.90

Valuation per 2000 lbs. $39.49

C. A. GOESSMANN, *Director*,

AMHERST, MASS.

☞ *The Bulletins of the Station will be sent free of charge to all parties interested in its work on application.*

J. E. Williams, Printer, Amherst, Mass.

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MASSACHUSETTS STATE

AGRICULTURAL EXPERIMENT STATION.

BULLETIN No. 9.

MAY, 1884.

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182. NOTES UPON INSECTS INJURIOUS TO FARM AND GARDEN CROPS.

In the annual report of the Station is to be found a statement of experiments made to ascertain the best means of destroying the many insects that make havoc among the crops of the farm and garden. Some of the experiments gave satisfactory results and extended preparations are being made to learn more of the *more harmless materials* that may be used as insecticides. As the results cannot be presented to the public in time to be of use the early part of this season, we give a brief statement of the remedies thus far found to be the most successful.

Cabbage Flea.—The first insect of importance that appears is the small black flea or jumping beetle that attacks the cabbage, radish, turnip, etc. Dusting with paris green mixed with one hundred times its weight of plaster has proved an effectual remedy. This must be done when the plants are wet and after every rain.

Cut Worm.—The cut worm of which there are several species, including the army worm, work only during the night, and may be destroyed by the same remedy as the above. We would advise a trial of pyrethrum powder mixed with five times its bulk of plaster as being more safe, although we have no positive proof that it will be effectual.

Striped Squash Bug.—The striped squash bug which has been so abundant for the past two seasons, is best kept in check by the use of plaster and paris green. For the family garden the safest and most satisfactory way to overcome them is to make a bottomless box twelve inches square, and six or eight inches deep, and cover it with mosquito netting. One of these boxes placed over each hill until the plants have become tough and hard, is a sure protection.

THE POTATO BEETLE.—The potato beetle has evidently become a permanent resident among us. Paris green extended with plaster, flour or water, is the only cheap and easily applied remedy known at present, but great care must be exercised in its use and especially in the place where the package is kept, that it may not get upon the food of animals.

CABBAGE WORM.—The cabbage worm, the larvæ of the common white butterfly, may be easily destroyed in several ways. That of hand picking, if begun before the first brood have passed into its perfect state, is effectual. We have also found that pyrethrum powder mixed with five times its bulk of plaster and dusted into the centre of the leaves with sulphur bellows, is certain destruction to every one of them. The application of insecticides in liquids to the cabbage has not been satisfactory on account of the peculiar structure of the leaf surface which allows the water to roll off in drops and not adhere to any part of it. Paris green is unsafe to use after the leaves have become over four inches in diameter.

CURRANT WORM.—The currant worm should be destroyed, while small, with the dust of hellebore or pyrethrum. The latter being perfectly harmless is to be more highly recommended.

PLUM WEEVEL.—There are two certain methods of capturing the plum weevil, the first by jarring the tree early in the morning and catching them upon sheets stretched below upon a frame or upon the ground, and the second by placing chicken coops under the trees. The former method must be attended to regularly every morning for three weeks after the plums have set, and in the latter case, if the number of trees is large, a large flock of chickens will be required to make that remedy effectual.

CODLING MOTH.—No positive remedy against the ravages of this insect has as yet been found. It is claimed that paris green sprayed over the tree in water is effectual, but should it prove so, it is far too dangerous a remedy to apply where grass or other crops are growing under them.

APPLE AND PEACH BORER.—For the destruction of these two insects no sure remedy has been found except the knife. It is probable that covering the trunk of the tree near the ground with the ink or tar used to catch the moths of the canker worm, or wrapping around the trunk bands of tarred paper, would assist in keeping them away.

THE ROSE BUG.—The rose bug has thus far been the most difficult to overcome of the whole tribe of injurious insects, and we can recommend no remedy with a great degree of confidence, but would advise the trial of the fumes of gas tar held under the vines a short time every evening while the grapes are forming. It is certainly offensive to them, and if used carefully need not injure the plant.

ROSE SLUGS.—This insect is easily destroyed by spraying with water and pyrethrum at the rate of one tablespoonful of the latter to a pailful of the former.

LETTERS.—Several letters have been received asking for information in regard to insects and fungus injurious to plants, which have been answered by letter, and for general information we insert the answers of a few of them.

Letter No. 1, containing shoots of the apple tree covered with a coating of black masses containing some fungus growth. These black masses are the result of dust adhering to the shoots made sticky by the exudations of the common apple aphis or plant louse which were unusually abundant the past two seasons and caused great injury to young trees. The remedy is to syringe with strong soap suds or with a tablespoonful of pyrethrum in one pail of water.

Letter No 2, contained twigs of the peach tree in which were found a double row of the eggs of the tree cricket (*Œcanthus niveus*). This insect lays its eggs more commonly in the branches of the raspberry and blackberry, but in some cases in those of the peach and plum. The larvæ, after hatching, leave the twigs and for a time feed upon plant lice, and later in the season upon succulent ripe fruit. The tree cricket is light green in color, and when full grown, is about three-fourths of an inch long, and lays its eggs in autumn in the centor of the shoots in long lines as mentioned above.

S. T. MAYNARD,

Professor of Botany and Horticulture,

Mass. Agricultural College.

FODDER AND FODDER ANALYSES.

183. COMMON MILLET.

Collected from plats of Station, when blooming, Aug. 14, 1883.

I.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	6.15	123.00			
Dry Matter.	93.85	1877.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	4.67	93.40			1 : 8.32
" Cellulose,	29.80	596.00			
" Fat,	2.04	40.80	17.14	42	
" Protein, (nitrogenous matter),	7.69	153.80	92.28	60	
Non-nitrogenous extract matter,	55.80	1116.00	725.40	65	
	100.00	2000.00	834.82		

184. COMMON MILLET.

From plats of the Station, when fully matured, Sept. 3, 1883.

II.

	Percentage Composition.	Constituents (in lbs). in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	6.73	134.60			
Dry Matter,	93.27	1865.40			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	4.23	84.60			1 : 8.05
" Cellulose,	33.39	667.80			
" Fat,	2.67	53.40	21.36	40	
" Protein, (nitrogenous matter),	7.09	141.80	85.08	60	
Non-nitrogenous extract matter,	52.62	1052.40	631.44	60	
	100.00	2000.00	737.88		

The analyses of both samples point towards an exhausted condition of the soil, on which they were raised.

185. PEARL MILLET. (In bloom).

Collected from plats of Station, Sept. 19, 1884.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., - - - - - - -	6.20	124.00			
Dry Matter, - - - - - - - - - - -	93.80	1876.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, - - - - - - - - - - -	4.80	96.00			
" Cellulose, - - - - - - - -	35.91	718.20			
" Fat, - - - - - - - - - - -	1.63	32.60	13.69	42	1:8
" Protein, (nitrogenous matter),	7.20	144.00	86.40	60	
Non-nitrogenous extract matter, - -	50.46	1009.20	655.98	65	
	100.00	2000.00	756.07		

The composition of this variety of millet differs but slightly from that of No. 183, I. This result is to some extent most likely more due to the inferior condition of the lands they were raised on, than to a corresponding character of the varieties examined.

186. HUNGARIAN GRASS. (Panicum germanicum).

From the farm of Levi Adams, Hadley, Mass.
Collected in bloom, Sept. 4, 1883.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., - - - - - -	7.45	149.00			
Dry Matter, - - - - - - - - - - -	92.55	1851.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, - - - - - - - - - - -	5.73	114.60			
" Cellulose, - - - - - - - -	31.96	639.20			1:6 22
" Fat, - - - - - - - - - - -	2.22	44.40	18.65	42	
" Protein, (nitrogenous matter),	9.45	189.00	113.40	60	
Non-nitrogenous extract matter, . -	50.64	1012.80	658.32	65	
	100.00	2000.00	790.37		

The composition of the above sample is very fair.

187. SERRADELLA.

(Ornithopus sativus. Brot).

I. Obtained from plats of the Station, when blooming, Aug. 14, 1883.

I.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	7.20	144.00			1 : 4.72
Dry Matter, ...	92 80	1856.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	5.87	117.40			
" Cellulose, ...	24.37	487.40			
" Fat, ...	2.37	47.40	28.44	60	
" Protein (nitrogenous matter),	17.85	357.00	224.91	63	
Non-nitrogenous extract matter, . .	49.54	990.80	990.80	100	
	100.00	2000.00	1244.15		

188. II. From plats of Station, collected Sept. 3, 1883, when fully matured.

II.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	8.70	174.00			1 : 5.47
Dry Matter, ...	91.30	1826.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	6.46	129.20			
" Cellulose, ...	25.14	502.80	236.32	47	
" Fat, ...	2.91	58.20	29.10	50	
" Protein, (nitrogenous matter),	15.26	305.20	183.12	60	
Non-nitrogenous extract matter, . .	50.23	1004.60	693.17	69	
	100.00	2000.00	1141.71		

The Serradella, like the vetch, is an annual leguminous plant, which has found its way from Portugal into central Europe some fifty years ago. It grows from one foot to one foot and one-half high, and prefers a moist deep sandy soil. Time of seeding and mode of cultivation correspond with those customary in the cultivation of peas. The growth of the plant is slow until the time of blooming, when it rapidly increases in size and nutritive constituents. The close of the blooming period at the end of August, is the best time for cutting the crop. Leading agriculturalists speak very highly of this fodder plant.

189. VETCH.

(Vicia sativa, var. angustifolia).

I. Collected from experimental plats, Aug. 15th, 1883, in bloom.

I.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ration.
Moisture at 100° C.,	8.35	167.00			
Dry Matter,	91.65	1833.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	7.97	159.40			1:4.02
" Cellulose,	30.68	613.60	331.34	54	
" Fat,	2.30	46.00	27.60	60	
" Protein, (nitrogenous matter),	15.76	315.20	239.55	76	
Non-nitrogenous extract matter,	43.29	865.80	562.77	65	
	100.00	2000.00	1161.26		

The vetch has received already considerable attention in various sections of the country; reports thus far speak with much satisfaction of the results. The plant resembles in many respects the common garden pea; there are early and late varieties in cultivation. Its period of vegetation is from 18 to 22 weeks, and the time for seeding corresponds with that of the pea. The common vetch is a hardier plant than the latter, and grows well upon an inferior soil. Its reputation as a valuable green fodder, either single or when grown in common with rey, oats, or barley. is well established.

190. II. Collected from experimental plats, Sept. 3, 1883, when fully matured. II.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	9.45	189.00			
Dry Matter, ...	90.55	1811.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	8.50	170.00			1 : 4.09
" Cellulose, ...	30.05	601.00	270.45	45	
" Fat, ...	2.69	53.80	32.28	60	
" Protein, (nitrogenous matter),	14.42	288.40	204.76	71	
Non-nitrogenous extract matter, . .	44.34	886.80	487.74	55	
	100.00	2000.00	995.23		

The seeds of the matured vetch are ground and commonly used as a rich nitrogenous fodder in place of ground peas and beans. In some sections of central Europe the flour of the seeds is used for bread. The straw is a valuable fodder, and ranks among the most nutritious kind obtained from leguminous plants.

191. BARNYARD GRASS. (Panicum crus-galli).
Collected in bloom from College Farm, August 14, 1883.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	6.65	133.00			
Dry Matter, ...	93.35	1867.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	10.82	216.40			1 : 2.94
" Cellulose, ...	33.72	674.40			
" Fat, ...	1.95	39.00	16.38	42	
" Protein, (nitrogenous matter),	15.27	305.40	183.24	60	
Non-nitrogenous extract matter, . .	38.24	764.80	497.12	65	
	100.00	2000.00	696.74		

This grass is found quite frequently around barns and compost heaps, as a weed. The analysis of the above sample shows strikingly the influence of a liberal manuring on the composition of the species of plants, of which it is a variety.

FERTILIZER ANALYSES.

192. GROUND HORN.

Of Perkins & Bradstreet, Danvers, Mass.

Sent on for examination by J. J. H. Gregory, Marblehead, Mass.

Moisture at 100° C.,	10 00
Organic and Volatile matter,	95 00
Ash,	5 00
Phosphoric acid,	1 36
Nitrogen in organic matter,	13 53

VALUATION PER 2000 LBS.

170.6 lbs. nitrogen at 10c.,	$27.06
27.2 lbs. phosphoric acid at 4½c.,	1.22
	$28.28

The inferior mechanical condition of the article advises the low valuation of the nitrogen present.

193. LOBSTER SHELLS.

Sent on for examination by J. Shedd, 90 Waltham St., Boston, Mass.

Moisture at 100° C.,	7.27
Calcium oxide,	22.24
Magnesium oxide,	1.30
Phosphoric acid,	3.52
Nitrogen,	4.50
Insoluble matter,	0.27

The material sent on consisted of coarse pieces of the shells with meat mass in a dry condition. The large percentage of carbonate of lime present tends to promote a rapid decomposition of the organic nitrogenous matter, and favors thus a speedy action of the lobster shells, when dried and ground before their application. Counting phosphoric acid in the coarsely ground material 4½ cts. per pound, and nitrogen 20 cts. per pound, its commercial value would be from 22 to 23 dollars per ton.

194. LIME KILN ASHES.

Collected of R. T. Prentiss, Holyoke, Mass.

195. ONONDAGA PLASTER.

Sent on by H. D. Fearing, Amherst, Mass.

	1[illegible]	195
	POUNDS [illegible]	HUNDRED.
Moisture at 100° C.,	30.70	22.55
Calcium oxide,	37.55	29.80
Magnesium oxide,	3.68	4.32
Potassium oxide,	1 70	
Phosphoric acid,	1.27	
Carbonic acid,	17.83	8.80
Sulphuric acid,		31.58
Insoluble matter,	3.30	10.70

Both articles are fair specimens of their kind. The lime kiln ashes sold at 22 cts. per bushel, and the New York gypsum at from 6 to 7 dollars per ton at their respective selling places.

196. CRUDE KIESERITE.

Of Randall Fertilizer Co., Boston, Mass.

Sent on by C. P. Preston, Danvers, Mass.

Moisture at 100° C.,	28.12
Magnesium oxide,	17.45
Calcium oxide,	3.13
Sulphuric acid,	36.87
Insoluble matter,	3.62

The sample contained 48.6 per cent. of sulphate of magnesia, from 7 to 8 per cent. of gypsum, and 2.23 per cent. of chloride of magnesium; it is consequently of fair quality.

197. DRY FISH.

Quinnipiac Co.'s dry ground fish.

Collected of D. A. Horton, Northampton, Mass.

Guaranteed composition; soluble and reverted (available) phosphoric acid, 2 to 4 per cent.; total phosphoric acid, 6 to 8 per cent.; nitrogen, 7 to 9 per cent., (equivalent to ammonia 9 to 11 per cent.).

198. Dry fish, collected of H. L. Phelps, Northampton, Mass.

Guaranteed composition; total phosphoric acid, 6 to 8 per cent.; ammonia, 10 to 12 per cent., (equivalent to nitrogen, 8.24 to 10 per cent.).

	197	198
	POUNDS PER HUNDRED.	
Moisture at 100° C.	10.65	9.10
Total Phosphoric Acid,	7.30	9.08
Soluble "	1.70	1.70
Reverted "	1.83	2.14
Insoluble "	3.77	5.24
Nitrogen in organic matter,	7.51	8.42
Insoluble Matter	2.05	2.62
Valuation per 2000 lbs.	$40.12	$45.65

199. FISH AND POTASH.

Bowkers' Fish and Potash.

Collected of C. F. Brown, Northampton, Mass.

Guaranteed composition; total phosphoric acid, 8 to 10 per cent.; potassium oxide, 4 to 6 per cent.; nitrogen 2½ to 3½ per cent.

	199
	POUNDS PER HUNDRED.
Moisture at 100° C.,	10.65
Total phosphoric acid,	10.78
Soluble "	2.24
Reverted "	1.52
Insoluble "	7.02
Potassium oxide,	3.73
Nitrogen, (in organic matter),	2.07
Insoluble matter,	7.20
Valuation per 2000 lbs.,	24.99

200. BONES.

Of National Fertilizer Co., Bridgeport, Conn.

Collected of Wilder & Puffer, Springfield, Mass.

Guaranteed composition; total phosphoric acid, 22 to 24 per cent.; ammonia, 2 to 3 per cent., (equivalent to nitrogen, 1.7 to 2.5 per cent.).

201. Fine Ground Bones, of Bowker Fertilizer Co., Boston, Mass. Collected in Amherst, Mass.

Guaranteed composition; total phosphoric acid, 20 to 23 per cent.; ammonia 3 to 4 per cent., (equivalent to nitrogen, 2.5 to 3.3 per cent.

	200.	201.
	POUNDS PER HUNDRED.	
Moisture at 100° C.,	9.40	10.00
Total phosphoric acid	25.37	22.74
Soluble phosphoric acid, Reverted "	3.92	3.97
Insoluble phosphoric acid,	21.45	18.77
Nitrogen,	2.28	3.85
Insoluble matter,	1.65	
Valuation per 2000 lbs.,	34.57	36.90

AMMONIATED SUPERPHOSPHATES AND COMPLETE MANURES.

202. Ammoniated superphosphate, of Geo. W. Miles' Co., Milford, Conn. Collected of D. J. Wright, Northampton, Mass.

Guaranteed composition; soluble and reverted phosphoric acid, (available), 8 to 12 per cent.; potassium oxide 2 to 3 per cent.; nitrogen 2¼ to 3¼ per cent.

203. L. L. Crocker's Ammoniated Bone Superphosphate. Collected of R. T. Prentiss, Holyoke, Mass.

Guaranteed composition; soluble phosphoric acid, 6 to 8 per cent.; reverted phosphoric acid, 2 to 4 per cent.; insoluble phosphoric acid, 1 to 2 per cent.; potassium oxide, 1 to 3 per cent.; ammonia, 3½ to 4½ per cent., (equivalent to nitrogen, 2.90 to 3.70 per cent.).

204. Stockbridge Manure. Potato. Bowker Fertilizer Co., Boston, Mass. Collected of R. T. Prentiss, Holyoke, Mass.

Guaranteed composition; total phosphoric acid, 8 to 10 per cent.; soluble and reverted phosphoric acid, (available), 7 to 8 per cent.; potassium oxide, 5 to 6 per cent.; 3¼ to 4¼ per cent. Nitrogen.

205. Bradley's X L Ammoniated Bone Superphosphate of Bradley Fertilizer Co., Boston, Mass. Collected of R. T. Prentiss, Holyoke, Mass.

Guaranteed composition; soluble phosphoric acid, 7 to 8 per cent.; reverted phosphoric acid, 2 to 3 per cent.; potassium oxide, 2 to 3 per cent.; nitrogen, 2.50 to 3¼ per cent.

	202	*203*	*204*	*205*
	POUNDS PER HUNDRED.			
Moisture at 100° C.,	19.63	12.18	17.60	16.65
Total phosphoric acid,	11.87	11.98	11.19	12.53
Soluble "	6.68	6.65	7.23	8.44
Reverted "	1.14	1.87	1.48	.98
Insoluble "	4.05	3.46	2.48	3.11
Nitrogen, (in organic matter),	2.81	3.43	1.83	3.22
Nitrogen, (in ammonia salts),			1.67	
Nitrogen, (in nitrates),			.46	.29
Potassium oxide,	1.12	.95	4.29	1.60
Insoluble matter,	5.55	4.85	4.40	5.10
Valuation per 2000 lbs.,	$31.24	$34.31	[illegible]	$36.72

C. A. GOESSMANN, *Director*,

AMHE[illegible], MASS.

☞ *The Bulletins of the Station will be sent free of [illegible] to all parties interested in its work [illegible] application. There are no [illegible] numbers of Bulletins from 1 to 6 [illegible] hand. The analytical statements of these Bulletins are embodied in the first annual report of the Station.*

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BULLETIN No. 10.

JUNE, 1884.

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206. OBSERVATIONS REGARDING THE VITALITY OF THE SEED OF VARIOUS WEEDS, AND THE CAUSES OF CERTAIN DISEASES OF GRASSES.

The several subjects submitted to me for answers by the Board of Control have been carefully investigated and I am able to make the following report:—

1. How is the vitality of the seeds of our most common weeds, such as dock, sorrel, chickweed, shepherd's purse, white daisy, etc., etc., affected by the action of the digestive organs of animals?

Answer. Seeds of the dock, sorrel, daisy and shepherd's purse were fed to a horse and the refuse collected. Upon careful examination it was found that the seeds, unless crushed, were uninjured and germinated readily when placed in soil under proper conditions of heat and moisture. The experiment was repeated several times with the same result.

2. How is the vitality of the common weed seeds, like the above, affected by the action of the compost-heap?

Answer. Having settled the point that weed seeds are not destroyed by the action of the digestive organs of animals, it becomes important to know how their vitality may be destroyed; for while the thorough farmer should never allow weeds to mature their seed on his farm, there are many instances where it becomes necessary to provide some means by which chance seeds may be destroyed. A series of experiments were carried out, the result of which is, that seeds are destroyed if exposed to a temperature of from 90° to 110° F. for from five to seven days in a moist compost-heap. In a dry compost-heap, where the temperature runs as high as the above, the seeds were found but little injured. The tests were applied only to the above named seeds, but it is probable that the results would be the same upon others as these are among the seeds of the greatest vitality. The efficiency of this mode of destruction depends upon the maintainance of a continued high temperature and moisture, which will cause the seeds to either germinate and then decay, or to decay before germinating. The amount of moisture can be easily regulated and by properly working over any pile of compost containing a large amount of organic matter, the required amount of heat may be obtained. From the above experiments it would seem doubtful if the practice of keeping swine upon manure piles to cause slow decomposition is the best for manure containing weed seeds. It is also doubtful if the seeds of weeds often put into the pens where pigs are kept will be destroyed by the action of the little heat there generated. It would probably be safer in both of the above cases to compost the manure in large piles before using it upon the land.

3. At what stage of blooming are the seeds of the white daisy (*leucanthemum vulgare*) matured enough to germinate?

Answer. This weed has become so abundant in the grass land of some sections of the state that it must be cut with the grass, and it becomes important to know if it can be cut with the grass before the the seeds mature. After a series of careful examinations it has been decided that when the flower first reaches its full expansion few or no seeds are mature enough to germinate, but that it requires only a few days for these seeds to mature to full ripeness. In view of these facts it would not seem safe for the farmer to depend wholly upon the early stage of cutting, but to afterwards compost all manures made from fodder containing weed seeds of any kind.

June Grass and White Top.—To this grass, on account of the many inflorescences that fail to mature and turn white, is often given the name of *white top*, and the question is often asked, "what is the cause of this condition?" Upon careful investigation it has been found that this condition is most prevalent upon land exhausted by long cropping or where the roots have been much injured by the larveae of the *June Bug* or *May Beetle*. The turning of the top to a white color is due to the destruction of the culm or stalk just above the last leaf, by a fungus growth. Upon rich land and where there are few insect larveae working at the roots, there is little or none of this white top, and we are led to reason that the fungus does not attack the stem of the grass until the cells have become weakened in some way.

S. T. MAYNARD,
Professor of Botany and Horticulture,
Mass. Agricultural College.

207. NOTES ON FEEDING EXPERIMENTS WITH CORN ENSILAGE.

The experiments were chiefly carried on for the purpose of testing the feeding value of corn ensilage, as compared with that of hay. A description of the general character of the ensilage as well as of the hay and corn meal used in this connection, will be found upon a few subsequent pages within this Bulletin. Three cows—crosses between native stock and Ayrshires—of a corresponding milking period—were selected from the herd of the Mass. Agricultural College, to serve for the trial. The previous mode of feeding, the amount of each article of fodder actually consumed per day, and the daily yield of milk were carefully noted during the week preceding the removal of the animals to the stalls of the Station (April 7—14). Each cow had received for some time previous to that date, four quarts of clear corn meal per day, together with all the hay they could consume. This mode of feeding was continued at the station from April 14 to 29, by careful application of the scale in all measurements, to secure reliable values for comparison.

HISTORY OF COWS.

I. Name, CLARA. Age, 5 years. Weight, 895 lbs. No. of calves, 3. Last calf, Feb. 25, 1884. Feed, 4 quarts of clear corn meal (6½ lbs.), and 15½ lbs. of hay. Average yield of milk per day (April 14 until 30th), 15½ lbs.

Composition of Milk.	*April 8.*	*April 11.*	*April 14.*
Water at 100° C.,	88.04	87.32	87.39
Total solids,	11.96	12.68	12.61
Fat (in solids),	3.27	3.48	3.56

Mean of three analyses.

Water,	87.58
Total solids,	12.42
Fat (in solids),	3.44

II. Name, NELLIE MAY. Age, 4 years. Weight, 860 lbs. No. of calves, 2. Last calf, Feb. 15, 1884. Feed, 4 quarts of clear corn meal (6½ lbs.), and 16⅓ lbs. of hay per day. Average yield of milk per day, 14½ lbs.

Composition of Milk.	*April 8.*	*April 11.*	*April 14.*
Water at 100° C.,	87.57	87.18	87.09
Total solids,	12.43	12.82	12.91
Fat (in solids),	3.71	3.82	3.87

Mean of three analyses.

Water,	87.28
Total solids,	12.72
Fat (in solids),	3.80

III. Name, **Fairy**. Age, 5 years. Weight, 862 lbs. No. of calves, 2. Last calf, Feb. 20, 1884. Feed, 4 quarts of clear corn meal (6½ lbs.), and 17 lbs. of hay per day. Average yield of milk per day, 18½ lbs., (April 14—30).

Composition of Milk.	*April 8.*	*April 11.*	*April 14.*
Water at 100° C.,	87.46	87.67	87.54
Total solids,	12.54	12.33	12.46
Fat (in solids),	3.33	3.20	3.34

Mean of three analyses.

Water,	87.56
Total solids,	12.44
Fat (in solids),	3.29

STATEMENT OF DRY VEGETABLE MATTER CONSUMED IN FORM OF HAY AND CORN MEAL BY EACH COW, BEFORE ENSILAGE WAS INTRODUCED.

I. **Clara.**

April 19—30.		*Dry Matter. (lbs.)*	*Milk Produced. (lbs.) per day.*
Hay consumed, per day (lbs.),	15.46	13.90	15½
Meal " " "	6.50	5.60	
	21.96	19.50	

II. **Nellie May.**

April 19—30.		*Dry Matter. (lbs.)*	*Milk Produced. (lbs.) per day.*
Hay consumed, per day (lbs.),	16⅓	14.70	14½
Meal " " "	6½	5.60	
	22⅚	20.30	

III. **Fairy.**

		Dry Matter. (lbs.)	*Milk Produced. (lbs.) per day.*
Hay consumed, per day (lbs.),	17.00	15.30	18½
Meal " " "	6.50	5.60	
	23.50	20.90	

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After the previously stated mode of feeding, and the quantity and quality of the milk obtained thereby had been carefully tested during two weeks' observation under the management of the Station,

CORN ENSILAGE

was introduced as an additional article of the daily diet, in the following way. The amount of corn meal, four quarts (6 1-2 lbs.) per day remained the same during the entire trial. The ensilage was gradually substituted for the hay in the daily fodder, as far as the animal felt disposed to consume it. During the first twelve days of the experiment, each was offered forty pounds of ensilage per day, and subsequently sixty pounds, besides all the hay they would consume. They varied widely in their preference, as subsequent detailed statements show. The manner of feeding was as follows: At 5 : 30 A. M. the meal was fed to the animals during milking, and at 6 o'clock the ensilage. At 12 o'clock M. from four to five pounds of hay were offered: and at five P. M. the remainder of the meal was given, and the rest of the ensilage soon after. At 8 o'clock P. M., from four to five pounds of hay were again offered. Any material remaining after each feeding was removed and weighed. As a rule they consumed first the leaves of the corn, and left, if any, more or less of the harder stem parts behind. They received twice per day all the water they would drink.

I. Name, Clara.

FEEDING.	Food consumed, (lbs.) per day.			Milk Produced, (lbs.) per day.		Amount of dry vegetable matter contained in the daily fodder consumed in pounds.
	Indian Meal.	English Hay.	Ensilage.	Morning.	Evening.	
Periods.						
May 1—6.	6½	7	33½	8⅓	7½	16.3
May 6—12.	6½	7	29½	8	7	15.8
May 12—18.	6½	5⅓	34⅓	7⅔	7	14·9
May 18—27.	6½	5⅓	28	7	6½	14.1

Analyses of Milk.

May,	*3*	*7*	*12*	*20*	*23*	*26*
Water,	87.25	87.39	87.20	87.69	87.88	87.97
Solids,	12.75	12.61	12.80	12.31	12.12	12.03
Fat (in solids),	3.68	3.62	3.66	3.47	3.21	3.47

Mean of three last stated analyses of milk.

Water,	87.85
Total solids,	12.15
Fat (in solids),	3.39

II. Name, NELLIE MAY.

FEEDING.	Food Consumed (lbs.) per day.			Milk Produced (lbs.) per day.		Amount of dry vegetable matter contained in the daily fodder consumed in pounds.
	Indian Meal.	English Hay.	Ensilage.	Morning.	Evening.	
Periods.						
May 1—6.	6½	7½	40	8½	7½	17.6
May 6—12.	6½	7⅓	40	8⅓	7	17.4
May 12—18.	6½	6	54	8	7⅓	18.1
May 18—27.	6½	5⅔	45½	8	7⅓	16.7

ANALYSES OF MILK.

May,	*3*	*7*	*12*	*20*	*23*	*26*
Water,	87.00	87.09	87.43	87.39	87.19	87.37
Solids,	13.00	12.91	12.57	12.61	12.81	12.63
Fat (in solids),	3.81	3.91	3.86	3.80	3.68	3.68

Mean of three last stated analyses of milk.

Water,	87.32
Total solids,	12.68
Fat (in solids),	3.72

III. Name, FAIRY.

FEEDING.	Food Consumed (lbs.) per day.			Milk Produced (lbs.) per day.		Amount of dry vegetable matter contained in the daily fodder consumed in pounds.
	Indian Meal.	English Hay.	Ensilage.	Morning.	Evening.	
Periods.						
May 1—6.	6½	8	40	10	9	18
May 6—12.	6½	8	40	10⅓	9	18
May 12—18.	6½	7⅓	59	10	9	19.9
May 18—27.	6½	7⅓	54½	10	9	19.4
May 27. June 10.	6½	7⅔	56	9.9	9	19.8

ANALYSES OF MILK.

May,	*3*	*7*	*12*	*20*	*23*	*26*	*June 10*
Water,	87.16	86.99	86.84	87.33	87.55	87.57	87.10
Solids,	12.84	13.01	13.16	12.67	12.45	12.43	12.90
Fat (in solids),	4.08	3.88	3.93	3.60	3.29	3.37	3.61

Mean of three last stated analyses of Milk.

Water,	87.41
Total solids,	12.59
Fat (in solids),	3.43

The cows, with the exception of No. 1, retained their original weight well.

SUMMARY OF OBSERVATIONS UNDER EXISTING CIRCUMSTANCES.

1. The cows differed widely in their preference for ensilage.
2. Reducing the ensilage to the same state of dryness noticed in the hay, we find that the total quantity of the *dry vegetable matter* previously consumed, has been considerably reduced, in consequence of the introduction of the ensilage. This is more apparent in Nos. I and II, than in No. III.
3. The quantity of milk has in every instance increased, in consequence of the addition of ensilage to *our customary mode of feeding*, counting the amount of dry vegetable matter in each case pound for pound with the milk produced.
4. The increase in quantity of milk, counting on the basis of the total amount of fodder consumed, was most pronounced in case of moderate quantities of ensilage, i. e. from 35 to 40 lbs. per day.
5. The quality of milk was not perceptibly changed, as far as *the density and the amount of fat was concerned.* None of the mean results obtained after feeding ensilage has been below the lowest results, before its introduction in the daily diet.

In stating the composition of the milk only with reference to water, solid matter and fat, it has been by no means assumed,—in following thereby the common usage,—that the information regarding these points suffices under all circumstances to establish the normal charter of a sample of milk. The total amount and the relative proportions of the various nitrogenous constituents of the milk,—commonly stated by the collective name—Casein,—are known to vary and to affect at times seriously its character.

Observations in that direction quite naturally suggested themselves in the course of our investigation. The results thus far obtained are, however,—for various reasons beyond our control,—not decisive enough to question at the present stage of our work seriously the good quality of the milk obtained in connection with the feeding of a moderate amount of corn ensilage. The total amount of nitrogenous matter—crude casein—noticed in case of cow No. II (May 11 and 26,) differed but slightly in different samples as far as its absolute quantity, and the relative proportions of casein, albumin and lactoprotein are concerned. The milk of cow No. III,—the largest consumer of ensilage, showed a somewhat larger amount of total nitrogenous matter—as compared with that from cow No. II; and the relative proportion of genuine casein had decreased, whilst that of albumin and lactoprotein showed a marked increase. Whether these results will prove hereafter to be merely of an incidental character, or will have to be ascribed to an excessive consumption of ensilage, farther studies at the earliest suitable occasion are designed to show. The financial side of the ensilage feeding is not discussed in this connection on account of the absence of exact figures regarding the cost of our ensilage.

The various articles of fodder used in the above stated feeding experiments are described under the following numbers in this bulletin: No. 208, Corn Meal; No. 209, Timothy Hay; No. 210, Corn Ensilage.

FODDER AND FODDER ANALYSES.

208.

CORN MEAL.

From John L. Holley, South Amherst, Mass.
Ninety-two per cent. passed through mesh, 144 to the square inch.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	13.55	271.0			
Dry Matter,	86.45	1729.0			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	1.42	28.4			1:9.66
" Cellulose,	2.64	52.8	17.95	34	
" Fat,	4.24	84.8	64.45	76	
" Protein, (nitrogenous matter),	10.40	208.0	176.80	85	
Non-nitrogenous extract matter,	81.30	1626.0	1528.44	94	
	100.00	2000.00	1787.64		

A fair article of its kind.

209. TIMOTHY HAY.

From the experimental Farm, 1883.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents	Nutritive Ratio.
Moisture at 100° C.,	8.70	174.0			
Dry Matter,	91.30	1826.0			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	4.04	80.8			
" Cellulose,	36.59	731.8			
" Fat,	2.12	42.4			
" Protein, (nitrogenous matter),	7.24	144.8			
Non-nitrogenous extract matter,	50.01	1000.2			
	100.00	2000.00			

The hay was harvested in July, after blooming. The sample was taken from the barn in November. The article can scarcely be called a fair average quality of its kind.

210. ENSILAGE OF CORN IN TASSEL.

Sample taken from Silo when opened, April 29th.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents	Nutritive Ration.
Moisture at 100° C.,	86.88	1737.6			
Dry Matter,	13.12	262.4			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	6.89	137.8			1:6.57
" Cellulose,	33.66	673.2	484.70	72	
" Fat,	3.88	77.6	58.20	75	
" Protein, (nitrogenous matter),	12.58	251.6	183.67	73	
Non-nitrogenous extract matter,	42.99	859.8	576.06	67	
	100.00	2000.00	1302.63		

The silo which furnished this ensilage has been described in the first annual report of the Station. The fodder corn which filled the silo was well tasselled out, and had a few days previously suffered from a severe frost on the night of Sept. 3d.; it had been cut into pieces from two to three inches in length, before it was well tramped down, covered and subjected to a pressure of sixty pounds to a square foot of surface. The silo was opened for the use of its contents on April 29th. The color of the ensilage was dark yellowish green; it had an acid taste and odor. On the top of the mass and around its sides could be noticed for some inches in thickness some mould. The main bulk of the mass,—judging from the opinion expressed by many visitors to the Station—who claimed to be familiar with the usual appearance of corn ensilage,—corresponded evidently with a large proportion of the ensilage fed during the past.

A comparison of the above stated analysis of the dried ensilage with an analysis of the frost-bitten corn fodder collected at the time when the silo was being filled (No. 211) shows a decrease of non-nitrogenous constituents, except in the case of fat; and a decided increase in nitrogenous matter (crude protein). The nutritive properties of the corn fodder had been greatly modified in consequence of its treatment in the silo; its nutritive ratio (i. e. relation of nitrogen-containing food constituents to non-nitrogen-containing constituents) had been raised to that of our better grasses. This result is not an exceptional one *in character;* it is only marked *in degree*,—judging from well endorsed observations in competent hands elsewhere; and is coöperated in the case of all kinds of ensilage. Yet these changes in quality are accompanied by a considerable destruction of valuable organic matter. The fact that the nitrogenous constituents (crude protein), resist better the destructive influences in the ordinary silo, than the non-nitrogenous plant-constituents,—as starch, sugar, cellulose, etc.—is the real cause of the alteration in the nutritive character of the fodder in consequence of our present management of the silo. An analysis of the liquid, which under a partial pressure upon our ensilage, accumulated upon the cleaned floor of the silo, admits of no other explanation. The investigation of the production of a good ensilage, together with a determination of cost as compared with hay, will be resumed at an early date.

LIQUID OF ENSILAGE TAKEN FROM THE BOTTOM OF THE SILO.

Specific Gravity at 20° C., 1.025

102.5 Grams of solution required ½ Gram of carbonate of soda for its neutralization.

Moisture at 100° C.,	81.52
Dry matter,	18.38
	100.00

ANALYSIS OF DRY MATTER.

Sesqui-oxide of iron,	.04
Calcium oxide,	.85
Magnesium oxide,	1.07
Phosphoric acid,	.20
Potassium oxide,	.81
Sodium oxide,	.16
Nitrogen,	.59

0.246 parts of the nitrogen found in the liquid, was present in form of soluble albuminoids; and 0.344 parts in form of ammonia compounds. The liquid contained from three to four per cent. more of solid matter than the original corn fodder.

211. CORN FODDER. (Frost-bitten).

(In tassel).

From experimental plats of the Station.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	8.83	176.60			
Dry Matter,	91.17	1823.40			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	4.86	97.20			1:9.83
" Cellulose,	29.05	581.00	418.32	72	
" Fat,	2.06	41.20	30.90	75	
" Protein, (nitrogenous matter),	8.63	172.60	126.00	73	
Non-nitrogenous extract matter,	55.40	1108.00	742.36	67	
	100.00	2000.00	1317.58		

This cornfodder served for the production of the previously described corn ensilage. Its frost-bitten condition, and *half matured stage of growth*, have, no doubt, seriously affected the quality and quantity of the ensilage.

FISH FERTILIZERS.

Sent on for examination from Danvers, Mass.

212. Claimed to be chemically prepared fish.

213. Claimed to be clear fish waste.

	212.	*213.*
	POUNDS PER	HUNDRED.
Moisture at 100° C.,	7.70	9.00
Total phosphoric acid,	8.15	11.72
Soluble "	0.67	
Reverted "	3.19	4.41
Insoluble "	4.29	7.31
Potassium oxide,	0.89	
Nitrogen, (in organic matter),	8.13	8.16
Insoluble matter,	14.65	3.70
Valuation per 2000 lbs.,	45.51	49 35

CORRECTION.—The percentage of nitrogen in No 197, of Bulletin No. 9, "Dry Fish of the Quinnipiac Fertilizer Co.," has to be changed from 7.51 to 8.23; the valuation of the article per ton of 2000 lbs., from $40.12 to $43.00.

FISH AND POTASH.

214. Dry Ground Fish, of Stearns & Co., New York. Collected of B. F. Bridges, So. Deerfield, Mass.

Guaranteed composition; bone phosphate 15 to 20 per cent., (equivalent to phosphoric acid 6.86 to 9.16); ammonia 9 to 11 per cent., (equivalent to nitrogen 7.41 to 9 per cent.

215. (XX) Fish and Potash, of Geo. W. Miles' Co., Milford, Conn. Collected of D. J. Wright, Northampton, Mass.

Guaranteed composition; soluble and reverted phosphoric acid 5 to 8 per cent.; potassium oxide 4 to 6 per cent.; ammonia 4 to 6 per cent.; (equivalent to nitrogen 3.30 to 5 per cent.)

	214	*215*
	POUNDS PER	HUNDRED.
Moisture at 100° C.	12.38	19.50
Total Phosphoric Acid,	7.99	9.74
Soluble "		4.86
Reverted "	1.78	0.04
Insoluble "	6.21	4.84
Potassium oxide,		3.05
Nitrogen,	7.57	3.40
Valuation per 2000 lbs.	$40.93	$30.34

C. A. GOESSMANN, *Director*,

AMHERST, MASS.

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BULLETIN No. 11.

SEPTEMBER, 1884.

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216. NOTES ON FEEDING EXPERIMENTS WITH CORN ENSILAGE, CONTINUED.

(See No. 207, Bulletin No. 10.)

The previous Bulletin contained a report of observations concerning the effect of feeding corn ensilage, as a mere substitute for English hay, on the yield of milk and on the general conditions of three cows of a corresponding milking period. The observations, as far as reported on that occasion, extended over a period of from six to seven weeks. The daily feed consumed was stated in each case with reference to its *dry vegetable matter*, to prevent misconceptions regarding the actual amount contained in the daily fodder rations at different stages of the experiment. The amount of dry vegetable matter, actually consumed each day, was reported pound for pound, in connection with a statement of the daily yield of milk in pounds. A comparison of these statements showed, that the fodder, in which the corn ensilage had been largely a substitute for meadow hay, had produced a larger yield of milk,—comparing the amount of dry vegetable matter consumed with the yield of milk—pound for pound. A continuation of these experiments, which is reported in a few subsequent pages, has not altered our former conclusions regarding the influence of corn ensilage on the yield of milk. The daily records during the month of June, point strongly in that direction.

The addition of a liberal amount of wheat shorts (bran) to the daily diet, (9th of June), has in most instances but slightly affected the absolute yield of milk for the better; and has at no time changed the relative proportions between dry vegetable matter and the yield of milk, in favor of the former, as compared with the feeding of corn ensilage alone as an essential additional constituent of the original daily diet. The main benefit derived from the addition of wheat shorts to the daily fodder rations, consisted evidently in the improved appearance of the cows, in the improvement of the milk, and in an increased value of the manure resulting.

The important relations which exist between chemical composition and general character of dry vegetable matter, and its nutritive value under various circumstances, will be discussed at a later date of our experiment.

I. RECORD OF MELIA.

Ayrshire: 11 years old; dropped last calf Feb. 15, 1884.

[Melia consumed larger quantities of ensilage, and has taken the place of I. Clara in our previous record.]

1884.	Feed consumed (lbs.) per day.				Milk produced (lbs.) per day.			Amt. of dry vegetable matter contained in the daily fodder consumed in pounds.	Weight of Animal, (pounds.)
	Corn Meal.	Wheat Shorts.	Hay.	Ensilage.	Morning.	Evening.	Total.		
June 1 -									
" 2 -									
" 3 -	6½		7	20	14	13½	27½	14.5	692½
" 4 -	"		6	40	15	14½	29½	16.2	
" 5 -	"		5	40	14	14	28	15.3	
" 6 -	"		5	40	15	13½	28½	15.3	
" 7 -	"		6	40	14	13½	27½	16.2	
" 8 -	"		5	40	15½	12	27½	15.3	
" 9 -	"	6½	6	50	14	13	27	23.2	
" 10 -	"	"	5	58	14	12½	26½	23.4	
" 11 -	"	"	5	59	14½	13	27½	23.5	
" 12 -	"	"	5	60	15	12	27	23.6	
" 13 -	"	"	6	60	14½	12	26½	24.5	
" 14 -	"	"	5	60	14	13	27	23.6	
" 15 -	"	"	5	60	14	13	27	23.6	
" 16 -	"	"	5	60	14	14	28	23.6	
" 17 -	"	"	12	Discontinued. Stock of ensilage exhausted.	13½	14	27½	22.1	755
" 18 -	"	"	14		13	14	27	23.9	
" 19 -	"	"	12		13½	13	26½	22.1	
" 20 -	"	"	12		13½	13	26½	22.1	
" 21 -	"	"	12		14	12	26	22.1	
" 22 -	"	"	14		14	13	27	23.9	
" 23 -	"	"	14		13	13	26	23.9	
" 24 -	"	Discontinued.	New Hay 16		14	12	26	20.0	760
" 25 -	"		19		14	12	26	22.7	
" 26 -	"		16		13	11½	24½	20.0	
" 27 -	"		20		13	11	24	23.6	
" 28 -	"		20		12	11	23	23.6	
" 29 -	"		20		12	11	23	23.6	
" 30 -	"		20		12	10½	22½	23.6	

ANALYSES OF MILK.

June	*16*	*30*
Water,	87.84	88.29
Solids,	12.16	11.71
Fat (in solids),	3.21	2.99

II. RECORD OF NELLIE MAY.

1884.	Feed consumed (lbs.) per day.				Milk produced (lbs.) per day.			Amt. of dry vegetable matter contained in the daily fodder consumed in pounds.	Weight of Animal, (pounds.)
	Corn Meal.	Wheat Shorts.	Hay.	Ensilage.	Morning.	Evening.	Total.		
June 1 -	6½		7	37	8	7	15	16.7	
“ 2 -	“		8	28	8	7	15	16.4	
“ 3 -	“		7	35	8½	7	15½	16.7	852½
“ 4 -	“		6	40	8½	8	16½	16.2	
“ 5 -	“		5	40	8	8	16	15.3	
“ 6 -	“		7	40	9	8	17	17.1	
“ 7 -	“		7	40	9	8½	17½	17.1	
“ 8 -	“		5	40	10½	8	18½	15.3	
“ 9 -	“	6½	5	40	10	9	19	21.0	
“ 10 -	“	“	7	40	10	8½	18½	22.8	
“ 11 -	“	“	7	40	10	9	19	22.8	
“ 12 -	“	“	7	40	9½	9	18½	22.8	
“ 13 -	“	“	6	40	10	9	19	21.9	
“ 14 -	“	“	6	40	10	9	19	21.9	
“ 15 -	“	“	7	40	10	9	19	22.8	
“ 16 -	“	“	7	40	10	10	20	22.8	
“ 17 -	“	“	16		10	10	20	25.7	895
“ 18 -	“	“	14	Stock of ensilage exhausted. Discontinued.	9½	9	18½	23.9	
“ 19 -	“	“	13		9½	9	18½	23.0	
“ 20 -	“	“	13		9½	9	18½	23.0	
“ 21 -	“	“	14		9½	9	18½	23.9	
“ 22 -	“	“	14		9½	9	18½	23.9	
“ 23 -	“	“	15		9	9	18	24.8	
“ 24 -	“	Discontinued.	New Hay 16		10	9	19	20.0	902
“ 25 -	“		20		9½	9	18½	23.6	
“ 26 -	“		16		9½	9	18½	20.0	
“ 27 -	“		20		9	9	18	23.6	
“ 28 -	“		20		9½	9	18½	23.6	
“ 29 -	“		20		9½	9	18½	23.6	
“ 30 -	“		20		9	9	18	23.6	

ANALYSES OF MILK.

June	*16*	*30*
Water,	86.89	87.20
Solids,	13.11	12.80
Fat (in solids),	3.81	3.83

III. RECORD OF FAIRY.

1884.		Food consumed (lbs.) per day.				Milk produced (lbs.) per day.			Amt. of dry vegetable matter contained in the daily fodder consumed in pounds.	Weight of Animal, (pounds.)
		Corn Meal.	Wheat Shorts.	Hay.	Ensilage.	Morning.	Evening.	Total.		
June	1 -	6½		8	55	9½	8	17½	20.0	
"	2 -	"		8	60	9½	8	17½	20.6	
"	3 -	"		8	60	10	9	19	20.6	885
"	4 -	"		8	60	10	9½	19½	20.6	
"	5 -	"		7	60	10	9½	19½	19.7	
"	6 -	"		8	60	10½	9½	20	20.6	
"	7 -	"		8	60	10	9½	19½	20.6	
"	8 -	"		7	58	11½	9	20½	19.5	
"	9 -	"	6½	7	60	11	9½	20½	25.4	
"	10 -	"	"	7	60	11	9	20	25.4	
"	11 -	"	"	7	60	11	9	20	25.4	
"	12 -	"	"	6	60	11	10	21	24.5	
"	13 -	"	"	6	60	11	10	21	24.5	
"	14 -	"	"	7	55	11	10	21	24.8	
"	15 -	"	"	8	60	11	10	21	26.3	
"	16 -	"	"	8	57	11	10	21	25.9	
"	17 -	"	"	16		11	10	21	25.7	910
"	18 -	"	"	15	Stock of ensilage exhausted. Discontinued.	10½	10	20½	24.8	
"	19 -	"	"	15		11	10	21	24.8	
"	20 -	"	"	14		10½	10	20½	23.9	
"	21 -	"	"	14		10	10	20	23.9	
"	22 -	"	"	14		10½	10	20½	23.9	
"	23 -	"	"	15		10	9½	19½	24.8	
"	24 -	"	Discontinued.	New Hay 16		10½	9	19½	20.0	885
"	25 -	"		20		10½	10	20½	23.6	
"	26 -	"		20		10½	9½	20	23.6	
"	27 -	"		20		10	9½	19½	23.6	
"	28 -	"		20		10	10	20	23.6	
"	29 -	"		20		10	10	20	23.6	
"	30 -	"		20		10	10	20	23.6	

ANALYSES OF MILK.

June	*10*	*16*	*30*
Water,	87.10	86.60	87.36
Solids,	12.90	13.40	12.64
Fat (in solids),	3.61	3.83	3.53

FODDER AND FODDER ANALYSES.

217. WHEAT BRAN.

From John L. Holley, South Amherst, Mass.

Thirty-three per cent. passed through mesh 144 to the square inch.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	12.08	241.6			
Dry Matter, ...	87.92	1758.4			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	7.92	158.4			1:4.16
" Cellulose, ...	13.72	274.4	54.88	20	
" Fat, ...	3.81	76.2	60.96	80	
" Protein, (nitrogenous matter),	15.67	313.4	275.79	88	
Non-nitrogenous extract matter, . .	58.88	1177.6	942.08	80	
	100.00	2000.00			

This quality of wheat bran, which is of a fair composition, has been used in the previously described feeding experiments.

218. CORN STOVER.

From plats of the Station.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	8.73	174 6			
Dry Matter, ...	91.27	1825.4			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	3.12	62.4			1:21.16
" Cellulose, ...	34.28	685.6			
" Fat, ...	1.27	25.4	7.62	30	
" Protein, (nitrogenous matter),	6.58	131.6	52.64	40	
Non-nitrogenous extract matter, . .	54.75	1095.0	1095.00	100	
	100.00	2000.00	1155.26		

219.

WHEAT GRAIN.

From plats of the Station.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	10.58	211.60			
Dry Matter,	89.42	1788.40			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	2.18	43.60			1:6.42
" Cellulose,	2.42	48.40			
" Fat,	1.79	35.80	30.64	80.0	
" Protein, (nitrogenous matter),	13.35	267.00	240.30	90.0	
Non-nitrogenous extract matter,	80.26	1605.20	1484.81	92.5	
	100.00	2000.00	1755 75		

The composition of this article is a very fair one.

220.

WHEAT STRAW.

From plats of the Station.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	6.50	130.00			
Dry Matter,	93.50	1870.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					1:29.09
Crude Ash,	7.44	148.80			
" Cellulose,	40.74	814.80	423.70	52	
" Fat,	1.59	31.80	8.59	27	
" Protein, (nitrogenous matter),	5.32	106.40	27.66	26	
Non-nitrogenous extract matter,	44.91	898.20	359.28	40	
	100.00	2000.00	819.23		

The composition of this sample is better than the average article.

FERTILIZER ANALYSES.

221. REFUSE SALT.

Collected of R. T. Prentiss, Holyoke, Mass.

Moisture at 100° C.,	1.70
Calcium oxide,	1.21
Magnesium oxide,	0.14
Sulphuric acid,	1.57
Sodium chloride,	95.38

The article is a fair specimen of its kind. A detailed discourse of the various kinds of salt used for agricultural purposes, etc., may be found in the annual report of the Mass. State Board of Agriculture for 1869, page 18.

AMMONIUM SULPHATE.

222. Collected of D. A. Horton, Northampton, Mass. Guaranteed 25 per cent. of ammonia.

223. Sent on for examination by M. W. Jefts, for the Ashly Farmer's Club, Ashly, Mass.

	222	*223*
	Pounds per	*hundred.*
Moisture at 100° C.,	1.88	0.42
Ammonia,	25.07	24.00
Valuation per 2000 lbs.,	$90.64	$87.12

The cost of this article has varied widely at times; the valuation is based on our annual rate, 22 cts. per pound of nitrogen in ammonia salts.

MURIATE OF POTASH.

224. Sent on by M. W. Jefts, for Ashly Farmer's Club, Ashly, Mass.

225. Collected of Boston Fertilizer Co., by C. P. Preston, Danvers, Mass.

226. Collected of Bowker Fertilizer Co., at Amherst, Mass.

	224	*225*	*226*
	Pounds per hundred.		
Moisture at 100° C.,	1.00	0.05	0.90
Potassium oxide,	51.94	49.60	50.80
Valuation per 2000 lbs.,	$44.15	$42.16	$43.18

WOOD ASHES.

Sent on for examination by G. B. Hall, Pres. of Ipswich Farmer's Club, Ipswich, Essex County, Mass.

227. Canada Ashes; sold at 34 cts. per bushel, weight 48 lbs.

228. Maine Ashes; sold at 30 cts. per bushel, weighing 42 lbs.

	227	*228*
	Pounds per hundred.	
Moisture at 100° C.,	5.46	18.00
Calcium oxide,	35.58	34.34
Potassium oxide,	5.83	4.17
Sodium oxide,	0.61	0.84
Phosphoric acid,	2.55	2.56
Insoluble matter,	11.95	8.70

The difference in the composition of these samples of wood ashes is largely due to a different state of moisture. The retail prices stated do not vary materially from those in our section of the State.

229. KAINITE.

Collected of D. A. Horton, Northampton, Mass.

Moisture at 100° C.,	2.15
Calcium oxide,	0.82
Magnesium oxide,	11.30
Potassium oxide,	16.48
Sulphuric acid,	21.91
Valuation per 2000 lbs.,	$14.08

230. LIME KILN ASHES.

Collected of J. A. Sullivan, Northampton, Mass.

Moisture at 100° C.,	20.55
Calcium oxide,	45.53
Magnesium oxide,	1.80
Potassium oxide,	1.35
Phosphoric acid,	2.92
Carbonic acid,	21.10
Insoluble matter,	8.23

Sold at 18 cts. per bushel in retail, and 12½ cts. per bushel in car loads.

231. PENGUIN ISLAND GUANO.

Sent on for examination.

Guaranteed composition; bone phosphate, 51.76 per cent. (equal to 23.07 phosphoric acid); ammonia 1.43 per cent., (equivalent to nitrogen 1.18 per cent.)

Moisture at 100° C.,	12.10
Total phosphoric acid,	24.35
Soluble " "	0.35
Reverted " "	6.97
Insoluble " "	17.03
Potassium oxide,	0.14
Nitrogen in organic matter,	0.23
Nitrogen in ammonia salts,	0.26
Nitrogen in nitrates,	0.24
Total nitrogen,	0.73
Valuation per 2000 lbs.,	$31.62

This article deserves a careful trial upon lands rich in organic matter; in particular upon moist grass lands.

232. DISSOLVED BONEBLACK.

Sent on by M. W. Jefts, for Ipswich Farmer's Club, Ipswich, Essex County, Mass.

Moisture at 100° C.,	11.05
Total phosphoric acid,	18.87
Soluble " "	17.83
Reverted " "	.53
Insoluble " "	.51
Insoluble matter,	.83
Valuation per 2000 lbs.,	$37.26

BONES.

233. Darling's Fine Bones. Collected of Parker & Gannet, Boston, Mass.

Guaranteed composition; phosphoric acid, 25 per cent.; nitrogen, 3 to 4 per cent.

Moisture at 100° C.,	4.70
Total phosphoric acid,	26.62
Soluble } " "	6.77
Reverted } " "	
Insoluble " "	19.85
Nitrogen,	3.56
Valuation per 2000 lbs.,	$50.25

AMMONIATED SUPERPHOSPHATES AND COMPLETE MANURES.

Moisture in Fertilizers. The quantity of moisture contained in a compound fertilizer exerts a controlling influence on the results of its analysis; and yet, comparatively speaking, but few manufacturers mention in their printed guaranty of composition, the approximate amount of that constituent in their articles, upon which their guaranteed composition is based.

An article, for instance, which, with 10 per cent. of moisture, analyzes 10 per cent. of soluble phosphoric acid, 2.5 per cent. of nitrogen, and 5. per cent. of potassium oxide, will analyze 9. per cent. of phosphoric acid, 2.25 per cent. of nitrogen, and 4.5 per cent. of potassium oxide, in case of containing 19 per cent. of moisture.

Statements of comparative tests regarding the *exact composition* of two fertilizers, are, for this reason, always made with a definite reference to a corresponding state of their moisture. Manufacturers who state the composition of the articles they offer for sale, without mentioning, at least approximately, the amount of moisture they contain, deprive the inspector of the chance to recognize exceptional conditions in their goods.

The manufacturer of fertilizers is expected to state, in the interest of his customers, the total weight of the article contained in each package;—besides—within certain limits—the amount of phosphoric acid, nitrogen and potassium oxide he offers for sale in each hundred weight. As long as the fertilizer is carefully stored, no serious alterations, either in total weight or in original composition, are expected within one season of keeping. Quite different, however, will be the result when it is stored in ill-constructed sheds, and damp storehouses, or meets with some accidental exposure to rain; for in that case the total weight of the package increases and the composition of its contents is reduced in strength in the same proportion as its percentage of water has increased. The chemical analysis refers to one hundred weight of the fertilizer; the customer who secures the entire package does not necessarily suffer; yet the manufacturer may suffer by a lower analysis of his goods, in consequence of neglecting to furnish all the information needed to recognize the results of exceptional conditions.

During past years I have noticed several instances where circumstances similar to those pointed out above, had caused the deterioration of a fertilizer tested and reported by me. During the past season my attention has again been called to a case of a similar character, which may be considered as the immediate cause of inserting here the previous discussion.

Bulletin No. 7, the first one of this season, contains an analysis (No. 170), of a fertilizer, manufactured by the Clark's Cove Guano Co., New Bedford, Mass., called the "Bay State Fertilizer," and offered for sale by E. S. Snow, of Belchertown, Mass. The sample was collected by one of my assistants. Careful inquiry since at the agent's storehouse, in connection with information from other sources, tends to show that the moisture (22 per cent.,) noticed in the article was largely due to a deficiency in the storeroom. Bags of fertilizer which were subsequently weighed, showed from 10 to 15 lbs. more than the bill of sale stated. I believe now, for above stated reason, that the article originally furnished by the company, was a fair specimen of its kind and within the customary guaranty of composition.

In making this statement, in justice to the manufacturer, I do not intend to convey the idea that the addition of a larger percentage of water exerts no other serious influence on a complete fertilizer than diluting the article, i. e., reducing its original strength; for changes of a more serious character are apt to occur; for instance in case nitrates are forming a source of nitrogen in a fertilizer, containing superphosphates, more or less of nitric acid will be rendered free, and thus directly and indirectly the amonnt of that costly ingredient reduced. The frequent occurrence of rotten bags in the fertilizer trade, finds a satisfactory explanation in circumstances similar to those pointed out.

234. Fertilizer sent on by the Sec. of the Hampshire, Franklin, and Hampden Agricultural Society. (Potassa mainly present as carbonate).

235. William Clark & Co.'s "Americus" Ammoniated Bone Superphosphate. Collected of B. L. Bragg & Co., Springfield, Mass.

Guaranteed composition; total phosphoric acid 10 to 13 per cent.; soluble phosphoric acid 6 to 8 per cent, reverted phosphoric acid 3 to 4 per cent.; insoluble phosphoric acid 1 to 2 per cent.; potassium oxide 1 to 2 per cent.; ammonia 2 to 3 per cent., (eqvivalent to nitrogen 1.65 to 2.50 per cent.)

236. Quinnipiac Extra Superphosphate. Collected of B. L. Bragg & Co., Springfield, Mass.

Guaranteed composition; total phosphoric acid 10 to 12 per cent.; soluble and reverted phosphoric acid (available) 8 to 10 per cent.; potassium oxide (in form of sulphate) 2 to 4 per cent.; nitrogen 1¾ to 2½ per cent.

237. Sparrow's Grass Fertilizer, of Judson & Sparrow, Boston, Mass. Collected of Everett & Gleason, Boston, Mass.

Guaranteed composition; soluble and reverted phosphoric acid, 8 to 9 per cent.; potassium oxide, 4 to 5 per cent.; ammonia, 5 to 6 per cent., (equivalent to nitrogen 4.12 to 5 per cent.)

	234	235	236	237
	POUNDS PER HUNDRED.			
Moisture at 100° C.,	14.65	17.37	19.88	12,57
Total phosphoric acid,	12.76	11.79	11.61	10.46
Soluble "	2.97	6.62	3.87	7.68
Reverted "	5.29	3.00	4.42	2.10
Insoluble "	4.50	2.17	3.32	.68
Potassium oxide,	23.81	1.85	2.06	4.52
Nitrogen, (in organic matter),	0.31	2.73	2.33	1.56
Nitrogen, (in ammonia salts),	0.16		0.81	3.15
Nitrogen, (in nitrates),	.24	.23		
Insoluble matter,	6.55	5.77	6.98	.50
Valuation per 2000 lbs.,	$50.88	$33.91	$34.56	$43.69

C. A. GOESSMANN, *Director*,

AMHERST, MASS.

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BULLETIN No. 12.

OCTOBER, 1884.

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238. NOTES ON FEEDING EXPERIMENTS WITH GLUTEN MEAL AS A CONSTITUENT OF THE DAILY DIET OF MILCH COWS.

The experiment was carried on for the purpose of studying the effect of gluten meal as a constituent of the daily diet of milch cows on the quantity and the quality of milk obtained, as well as on the cost of its production, under several specified circumstances. The same cows, which served in the trial with corn ensilage, hay, Indian meal, and wheat bran, (see Bulletins 10 and 11), were used in the late trial with gluten meal. The observations extended over a period of three months. The third period of feeding was not extended beyond two weeks on account of the bad influence of a too liberal supply of nitrogenous constituents in the daily diet during very warm weather on the general condition of the cows. The mode of feeding was essentially the same as reported on previous occasions. The gluten meal was fed with an equal weight of wheat bran to compensate its deficiency in phosphates of lime and magnesia, and to render it more palatable. The designed amount of both substances was in each instance mixed and moistened, and fed in two meals during milking; the hay followed, mornings, noons, and after milking, evenings; care being taken to ascertain by weight, before and after meals, the exact amount consumed.

The composition and the general character of the Gluten meal, is described in a few subsequent pages. The cost of the daily fodder rations used in these experiments are based on our local market prices; gluten meal, $22.50, wheat bran, $23.00, and hay, $15.00 per ton; corn meal has cost during our trials $28.00, per ton. It has been the aim in our subsequent statement of results to render prominent the controlling influence of the daily yield of milk, on its cost under a corresponding system of feeding. It will be noticed in our trials, that under nearly identical conditions, as far as kind of fodder and period of milking are concerned, the milk of one cow as compared with that of an other one may cost the owner of the animals from 40 to 90 per cent. more in one case than in the other. A careful comparison of the subsequent detailed statement of our late experiment with those of previous Bulletins, (Nos. 10 and 11), tends to show that a good gluten meal at the stated cost, ought to be considered a valuable addition to our commercial concentrated fodder articles. The rations fed during the first feeding period and at the close of the experiment, (IV Period), deserve from an economical standpoint a trial on the part of dairymen. Our results were satisfactory as far as the yield of milk of a good quality is concerned.

I. RECORD OF MELIA.

FEEDING 1.	Feed consumed (lbs.) per day.			Milk produced (lbs.) per day.			Amt. of dry vegetable matter contained in the daily fodder consumed, in pounds.	Weight of Animal, (pounds.)
	Gluten Meal.	Shorts.	English Hay.	Morning.	Evening.	Total.		
Periods.								
July 1—8, - -	3 1/4	3 1/4	20	13	12 4/7	25 4/7	23.97	782 1/2
" 8—15, - -	"	"	"	14 2/7	13	27 2/7	"	"
" 15—22, - -	"	"	"	13 5/7	12 5/7	26 3/7	"	"
" 22—29, - -	"	"	"	14 1/7	13	27 1/7	"	762 1/2
" 29, Aug. 5, -	"	"	"	14 3/7	13 6/7	27 2/7	"	795

Nutritive Ratio, 1 : 6.32.

ANALYSES OF MILK.

July	*12th,*	*22d,*	*28th,*	*Aug. 4th.*
Water,	88.15	87.30	87.40	87.92
Solids,	11.85	12.70	12.60	12.08
Fat (in solids),	3.28	3.14	3.48	3.20

Amount of fodder consumed during the entire feeding period, and cost of same.

	113¾ lbs. Gluten meal,	$1.27
	113¾ lbs. Shorts,	1.31
	700 lbs. Hay,	5.25
Total,	927½ lbs.	$7.83

Daily produce of milk,	26 7/10 lbs., 13.36 qts.
Cost of daily fodder,	22.4 cts.
Cost of fodder per quart of milk,	1.68 cts.

RECORD OF MELIA.

FEEDING. 2.	Feed consumed (lbs.) per day.			Milk produced (lbs.) per day.			Amt. of dry vegetable matter contained in the daily fodder consumed, in pounds.	Weight of Animal, (pounds.)
	Gluten Meal.	Shorts.	English Hay.	Morning.	Evening.	Total.		
Periods.								
Aug. 5—12, - -	6½	3¼	18 4/7	14 4/7	13 3/7	28	25.5	777
" 12—19, - -	"	"	19 3/7	15	13	28	26.33	782
" 19—26, - -	"	"	15 6/7	13 3/7	13 5/7	27 1/7	23.10	795
" 26, Sept. 2, -	"	"	19 3/7	14	12 2/7	26 2/7	26.33	827½

Nutritive Ratio, 1 : 5.32.

ANALYSIS OF MILK.

Aug. 11th.

Water,	87.15
Solids,	12.85
Fat (in solids),	3.49

Amount of fodder consumed during the entire feeding period, and cost of same.

	182 lbs. Gluten meal,	$2.04
	91 lbs. Shorts,	1.05
	517 lbs. Hay,	3.88
Total,	790 lbs.	$6.97.

Cost of fodder per day,	24.9 cents.
Average produce of milk per day,	27.36 lbs., 13.68 qts.
Cost of fodder per quart of milk,	1.82 cents.

RECORD OF MELIA.

FEEDING. 3.	Feed consumed (lbs.) per day.			Milk produced (lbs.) per day.			Amt. of dry vegetable matter contained in the daily fodder consumed, in pounds.	Weight of Animal, (pounds.)
	Gluten Meal.	Shorts.	English Hay.	Morning.	Evening.	Total.		
Periods.								
Sept. 2—9, - -	$6\frac{1}{2}$	$6\frac{1}{2}$	$14\frac{2}{7}$	$14\frac{1}{7}$	12	$26\frac{1}{7}$	24.50	784
" 9—16, - -	"	"	$13\frac{5}{7}$	12	$10\frac{3}{7}$	$22\frac{3}{7}$	23.97	815

Nutritive Ratio, 1 : 4.42.

ANALYSIS OF MILK.

Sept. 10th.

Water,	87.60
Solids,	12.40
Fat (in solids),	3.55

Amount of fodder consumed during the entire feeding period, and cost of same.

	91 lbs. Gluten meal,	$1.02
	91 lbs. Shorts,	1.05
	196 lbs. Hay,	1.47
Total,	378 lbs.	$3.54

Cost of fodder per day,	25.3 cents.
Average produce of milk per day,	24.3 lbs., 12.15 qts.
Cost of fodder per quart of milk,	2.08 cents.

RECORD OF MELIA.

FEEDING. 4.	Feed consumed (lbs.) per day.			Milk produced (lbs.) per day.			Amt. of dry vegetable matter contained in the daily fodder consumed, in pounds.	Weight of Animal, (pounds.)
	Gluten Meal.	Shorts.	English Hay.	Morning.	Evening.	Total.		
Periods.								
Sept. 16—23, -	$3\frac{1}{4}$	$3\frac{1}{4}$	19.4	12.86	11.00	23.86	23.42	845
" 23, Oct. 1, -	"	"	20	13.36	12.00	25.36	23.97	790

Nutritive Ratio, 1 : 6.25.

ANALYSES OF MILK.

Sept.	*17th,*	*30th.*
Water,	87.48	87.56
Solids,	12.52	12.44
Fat (in solids),	3.26	3.14

Amount of fodder consumed during the entire feeding period, and cost of same.

	45.5 lbs. Gluten meal,	$0.51
	45.5 lbs. Shorts,	.52
	276. lbs. Hay,	2.07
Total,	367. lbs.	$3.10

Cost of fodder per day,	22.14 cents.
Average production of milk per day,	24.6 lbs., 12.32 qts.
Cost of fodder per quart of milk,	1.8

II. RECORD OF NELLIE MAY.

FEEDING. 1.	Feed consumed (lbs.) per day.			Milk produced (lbs.) per day.			Amt. of dry vegetable matter contained in the daily fodder consumed, in pounds.	Weight of Animal, (pounds.)
	Gluten Meal.	Shorts.	English Hay.	Morning.	Evening.	Total.		
Periods.								
July 1—8, - -	$3\frac{1}{4}$	$3\frac{1}{4}$	20	$9\frac{5}{7}$	$9\frac{2}{7}$	19	23.97	925
" 8—15, - -	"	"	"	10	$9\frac{1}{7}$	$19\frac{1}{7}$	"	917
" 15—22, - -	"	"	"	10	$9\frac{1}{7}$	"	"	900
" 22—29, - -	"	"	"	$9\frac{6}{7}$	$8\frac{3}{7}$	$18\frac{2}{7}$	"	892
" 29, Aug. 5, -	"	"	"	$9\frac{4}{7}$	$8\frac{1}{7}$	$17\frac{5}{7}$	"	937

Nutritive Ratio, 1 : 6.32.

ANALYSES OF MILK.

July	*12th,*	*22d,*	*28th,*
Water,	87.11	86.73	86.49
Solids,	12.89	13.27	13.51
Fat (in solids),	3.86	3.61	4.01

Amount of fodder consumed during the entire feeding period, and cost of same.

	113¾ lbs. Gluten meal,	$1.27
	113¾ lbs. Shorts,	1.31
	700 lbs. Hay,	5.25
Total,	927½ lbs.	$7.83

Daily produce of milk,	18.63 lbs., 9.31 qts.
Cost of fodder per day,	22.4 cts.
Cost of fodder per quart of milk,	2.41 cts.

RECORD OF NELLIE MAY.

FEEDING. 2.	Feed consumed (lbs.) per day.			Milk produced (lbs.) per day.			Amt. of dry vegetable matter contained in the daily fodder consumed, in pounds.	Weight of Animal, (pounds.)
	Gluten Meal.	Shorts.	English Hay.	Morning.	Evening.	Total.		
Periods.								
Aug. 5—12, - -	6½	3¼	20	8 4/7	8	16 4/7	26.86	945
" 12—19, - -	"	"	20	8 5/7	8	16 5/7	26.86	945
" 19—26, - -	"	"	19 3/7	8	7	15	26.26	960
" 26, Sept. 1, -	"	"	20	8 1/7	7 1/7	15 2/7	20.86	977

Nutritive Ratio, 1 : 5.45.

ANALYSES OF MILK.

Aug.	*5th,*	*11th.*
Water,	86.77	86.75
Solids,	13.23	13.25
Fat (in solids),	4.01	4.06

Amount of fodder consumed during the entire feeding period, and cost of same.

	182 lbs. Gluten meal,	$2.04
	91 lbs. Shorts,	1.05
	556 lbs. Hay,	4.17
Total,	829 lbs. Hay,	7.26

Cost of fodder per day,	25.93 cts.
Average produce of milk per day,	15.9 lbs., 7.95 qts.
Cost of fodder per quart of milk,	3.38 cts.

RECORD OF NELLIE MAY.

FEEDING. 3.	Feed consumed (lbs.) per day.			Milk produced (lbs.) per day.			Amt. of dry vegetable matter contained in the daily fodder consumed, in pounds.	Weight of Animal, (pounds.)
	Gluten Meal.	Shorts.	English Hay.	Morning.	Evening.	Total.		
Periods.								
Sept. 2—8, - -	$6\frac{1}{2}$	$6\frac{1}{2}$	$19\frac{1}{7}$	$8\frac{1}{7}$	$7\frac{5}{7}$	$15\frac{6}{7}$	28.95	955
" 8—15, - -	"	"	$18\frac{2}{7}$	$7\frac{3}{7}$	$6\frac{3}{7}$	$13\frac{6}{7}$	28.15	985

Nutritive Ratio, 1 : 5.1.

ANALYSIS OF MILK.

Sept.	*10th.*
Water,	85.18
Solids,	14.82
Fat (in solids),	4.59

Amount of fodder consumed during the entire fedding period, and cost of same.

	91 lbs. Gluten meal,	$1.02
	91 lbs. Shorts,	1.05
	270 lbs. Hay,	2.03
Total,	452 lbs.	$4.10

Average produce of milk per day,	14.18 lbs., 7.09 qts.
Cost of fodder per day,	29.3 cts.
Cost of fodder per quart of milk,	4.13 cts.

RECORD OF NELLIE MAY.

FEEDING. 4.	Feed consumed (lbs.) per day.			Milk produced (lbs.) per day.			Amt. of dry vegetable matter contained in the daily fodder consumed, in pounds.	Weight of Animal, (pounds.)
	Gluten Meal.	Shorts.	English Hay.	Morning.	Evening.	Total.		
Periods.								
Sept. 15—22, -	$3\frac{1}{4}$	$3\frac{1}{4}$	$17\frac{3}{7}$	$6\frac{4}{7}$	$5\frac{4}{7}$	$12\frac{1}{7}$	21.67	$1002\frac{1}{2}$
" 22—29, -	"	"	20	$7\frac{3}{7}$	$6\frac{6}{7}$	$14\frac{2}{7}$	23.97	1005

Nutritive Ratio, 1 : 6.11.

ANALYSES OF MILK.

Sept.	*17th,*	*30th.*
Water,	85.04	85.92
Solids,	14.96	14.08
Fat (in solids),	4.36	4.45

Amount of fodder consumed during the entire feeding period, and cost of same.

	$45\frac{1}{2}$ lbs. Gluten meal,	$0.51
	$45\frac{1}{2}$ lbs. Shorts,	.52
	274 lbs. Hay,	2.06
Total,	365 lbs.	$3.09

Average produce of milk per day,	13.46 lbs., 6.82 qts.
Cost of fodder per day,	22.1 cts.
Cost of fodder per quart of milk,	3.25 cts.

III. RECORD OF FAIRY.

FEEDING. 1.	Feed consumed (lbs.) per day.			Milk produced (lbs.) per day.			Amt. of dry vegetable matter contained in the daily fodder consumed, in pounds.	Weight of Animal, (pounds.)
	Gluten Meal.	Shorts.	English Hay.	Morning.	Evening.	Total.		
Periods.								
July 1—8, - -	$3\frac{1}{4}$	$3\frac{1}{4}$	20	$10\frac{1}{7}$	$9\frac{4}{7}$	$19\frac{5}{7}$	23.97	907
" 8—15, - -	"	"	"	$10\frac{6}{7}$	$10\frac{1}{7}$	21	"	927
" 15—22, -	"	"	"	$10\frac{6}{7}$	10	$20\frac{6}{7}$	"	$912\frac{1}{2}$
" 22—29, -	"	"	"	$10\frac{2}{7}$	$9\frac{2}{7}$	$19\frac{4}{7}$	"	902
" 29, Aug. 4, -	"	"	"	$10\frac{1}{7}$	9	$19\frac{1}{7}$	"	935

Nutritive Ratio, 1 : 6.32.

ANALYSES OF MILK.

July	*12th,*	*22d,*	*28th,*	*Aug. 4th.*
Water,	87.05	86.42	86.82	86.79
Solids,	12.95	13.58	13.18	13.21
Fat (in solids),	3.76	3.73	3.67	3.81

Amount of fodder consumed during the entire feeding period, and cost of same.

	113¾ lbs. Gluten meal,	$1.27
	113¾ lbs. Shorts,	1.31
	700 lbs. Hay,	5.25
Total,	927½ lbs.	$7.83

Average produce of milk per day,	20.1 lbs., 10 qts.
Cost of fodder per day,	22.4 cts.
Cost of fodder per quart of milk,	2.24 cts.

RECORD OF FAIRY.

FEEDING. 2.	Feed consumed (lbs.) per day.			Milk produced (lbs.) per day.			Amt. of dry vegetable matter contained in the daily fodder consumed, in pounds.	Weight of Animal, (pounds.)
	Gluten Meal.	Shorts.	English Hay.	Morning.	Evening.	Total.		
Periods.								
Aug. 4—11, - -	$6\frac{1}{2}$	$3\frac{1}{4}$	20	$10\frac{3}{7}$	$9\frac{4}{7}$	20	26.86	942
" 11—18, -	"	"	20	$10\frac{5}{7}$	$9\frac{5}{7}$	$20\frac{3}{7}$	26.86	952
" 18—25, -	"	"	$19\frac{3}{7}$	$9\frac{6}{7}$	9	$18\frac{6}{7}$	26.26	965
" 25, Sept. 1, -	"	"	$19\frac{5}{7}$	10	$8\frac{5}{7}$	$18\frac{5}{7}$	26.67	1027½

Nutritive Ratio, 1 : 5.45.

ANALYSIS OF MILK.

Sept. 11th.

Water,	86.39
Solids,	13.61
Fat (in solids,)	3.91

Amount of fodder consumed during the entire feeding period, and cost of same.

	182 lbs. Gluten meal,	$2.04
	91 lbs. Shorts,	1.05
	554 lbs. Hay,	3.79
Total,	827 lbs.	$6.88

Average produce of milk per day,	19.5 lbs., 9.75 qts..
Cost of fodder per day,	24.6 cts.
Cost of fodder per quart of milk,	2.52 cts.

RECORD OF FAIRY.

FEEDING. 3.	Feed consumed (lbs.) per day.			Milk produced (lbs.) per day.			Amt. of dry vegetable matter contained in the daily fodder consumed, in pounds.	Weight of Animal, (pounds.)
	Gluten Meal.	Shorts.	English Hay.	Morning.	Evening.	Total.		
Periods.								
Sept. 1—8, - -	$6\frac{1}{2}$	$6\frac{1}{2}$	20	$9\frac{3}{7}$	$8\frac{4}{7}$	18	29.71	$1002\frac{1}{2}$
" 8—15, - -	"	"	$16\frac{4}{7}$	$9\frac{1}{7}$	$7\frac{6}{7}$	17	26.65	1000

Nutritive Ratio, 1 : 4.96.

ANALYSIS OF MILK.

Sept. 10th.

Water,	85.60
Solids,	14.40
Fat (in solids,)	4.84

Amount of fodder consumed during the entire feeding period, and cost of same.

	91 lbs. Gluten meal,	$1.02
	91 lbs. Shorts,	1.05
	251 lbs. Hay,	1.88
Total,	433 lbs.	$3.95

Average produce of milk per day,	14.68 lbs., 7.34 qts.
Cost of fodder per day,	28.2 cts.
Cost of fodder per quart of milk,	3.84 cts.

RECORD OF FAIRY.

FEEDING. 4.	Feed consumed (lbs.) per day.			Milk produced (lbs.) per day.			Amt. of dry vegetable matter contained in the daily fodder consumed, in pounds.	Weight of Animal, (pounds.)
	Gluten Meal.	Shorts.	English Hay.	Morning.	Evening.	Total.		
Periods.								
Sept. 15—22, -	$3\frac{1}{4}$	$3\frac{1}{4}$	$17\frac{5}{7}$	$9\frac{5}{7}$	$8\frac{5}{7}$	$18\frac{3}{7}$	21.96	$1007\frac{1}{2}$
" 22—29, -	"	"	20	10	9	19	23.97	1035

Nutritive Ratio, 1 : 6.21.

ANALYSES OF MILK.

Sept.	*17th,*	*30th.*
Water,	85.85	85.99
Solids,	14.15	14.01
Fat (in solids,)	4.06	4.11

Amount of fodder consumed during the entire feeding period, and cost of same.

	45½	lbs. Gluten meal,	$0.51
	45½	lbs. Shorts,	0.52
	269	lbs. Hay,	2.02
Total,	360	lbs.	$3.05

Average produce of milk per day,	18.9 lbs., 9.45 qts.
Cost of fodder per day,	21.8 cts.
Cost of fodder per quart of milk,	2.31 cts.

FODDER AND FODDER ANALYSIS.

239. GLUTEN MEAL.

From Chicago Sugar Refining Co.

Eighty-five per cent. passed through mesh 144 to square inch.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	11.68	233.6			1:2.92
Dry Matter,	88.32	1766.4			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	0.79	15.8			
" Cellulose.	0.77	15.4	5.24	34	
" Fat,	3.94	78.8	59.89	76	
" Protein, (nitrogenous matter),	28.24	564.8	480.08	85	
Non-nitrogenous extract matter,	66.26	1325.2	1245.69	94	
	100.00	2000.00	1790.90		

The gluten meal is obtained as a by-product in the manufacture of starch and glucose from corn. It consists mainly of the germs of the latter with more or less skin parts and starch. The supply of this substance has acquired considerable proportions in consequence of the recent development of the glucose industry in the country.

Examinations of samples from various sources have demonstrated its highly nitrogenous character, and left but little doubt about its value for feeding purposes under suitable circumstances. For details in this direction I refer, as far as my own observations and statements are concerned, to BULLETIN I, page 11, and BULLETIN V, page 5. The variations noticed in composition are in the main evidently caused by modifications in the manufacturing process,—a circumstance by no means an exceptional one, as far as the gluten-meal is concerned: for all our valuable refuse materials for fodder, as brans, oil-cakes, etc. suffer from the same influence. The sample, which served for our feeding experiments and furnished the material for the above analysis, was obtained by the following process, according to the kind communication of Dr. A. Behr, the superintendent of the Chicago Sugar Refining Company: "The process mostly followed in starch and glucose works for the separation of starch includes the use of caustic-soda for dissolving the gluten—(nitrogenous constituent of the corn). Our process differs in these particulars, that we do not use any caustic-soda at all and that we separate the germs of the corn before it is finally ground up. The consequence is, that gluten-meal contains no caustic-soda or sodium-salts, and is comparatively poor in fat,—this being for the greater part removed with the germs. The way we proceed is shortly, as follows: The water as it comes from the mills and carries the fine starch and gluten in suspension is run over long slightly inclined troughs: the ordinary 'Starch-Tables.' Here the heavy starch settles, while the lighter particles, small starch, gluten, fiber and fat are carried away with the water. This mixture is allowed to settle in large vats, the clear water drawn off, and the residue pumped into filter presses. The press cakes are dried in steam driers, ground up in mills and in this form make the gluten-meal." The calculation of the digestible portion of the gluten-meal is based on that noticed in the corn-meal in actual feeding-tests. The numerical relations between the digestible amount of nitrogenous constituents and of carbohydrates or non-nitrogenous constituents in the above sample of gluten-meal (1 : 2.92) corresponds quite closely with that in a fair sample of peas, its mineral constituents are however but one-fifth of that of the latter.

The article is offered for sale by the carload in bulk at $21.00 per ton, or $22.50 in bags, at Boston R. R. depots; similar charges have been made in Springfield.

C. A. GOESSMANN, *Director*,

AMHERST, MASS.

☞*P. S. The Bulletins of the Experiment Station will be sent free of charge to all parties interested in its work, on application.*

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BULLETIN No. 13.

NOVEMBER, 1884.

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240. NOTES ON FEEDING EXPERIMENTS WITH PIGS.

The experiment described in a few subsequent pages is the first of a series planned for the purpose of studying the comparative feeding value of skim milk and of creamery butter milk, in connection with corn meal, for the production of pork. To secure a suitable basis for the work, it was decided to ascertain, first the facts regarding the results of feeding equal measures of skim milk and of butter milk with a corresponding weight of corn meal in both cases. The skim milk was obtained from the dairy of the college and the station, the butter milk from the factory of the Amherst Co-operative Creamery Association. The skim milk was rated at two cents per gallon, and the creamery butter milk 1.37 cts. per gallon—the contractor's price. Corn meal was bought at $28.00 per ton. Several analyses of both kinds of milk and the mean of three analyses of the corn meal, fed during the experiment, are stated further on, (see Nos. 241, 242 and 243,) in this Bulletin. The skim milk contained about 2.5 per cent. more solid matter, than the creamery butter milk, a circumstance most likely due to the access of some water from the first washing of the butter. Six pigs from forty to fifty pounds in weight, (Berkshires,) secured from the College farm, were used for the experiment; three of them were fed with skim milk and corn meal, (Lot A), and three with creamery butter milk and corn meal, (Lot B). Each of the two lots consisted of one barrow and two sows; the former (III) gave in both lots the best results. The animals were fed alike in the following way: one-third of the daily ration of milk was fed with one-half of the daily ration of corn meal, at 6 o'clock, A. M.; one-third of the milk at 12 o'clock, M., without any meal; and the remaining third, part of milk with one-half of the meal, at 6 o'clock, P. M. Whenever the previous feed was consumed, some hours before a succeeding feeding time, the amount of daily fodder was gradually increased. This rule of feeding was carried out during the entire trial and suffered only a temporary modification in consequence of a few short periods of very hot weather. At the beginning of the experiment about two ounces of corn meal were fed for every quart of milk, and subsequently three ounces for every quart. This proportion of corn meal to milk produced better results in the case of butter milk (Lot B), than in the case of skim milk (Lot A), considering the larger amount of solid matter contained in the latter. Nearly one-fourth of the solid matter noticed in the skim milk shows no return of a proportionate increase in live weight, as will be found on comparing the subsequent detailed record. The total live weight and dressed weight of both lots of animals differ only two to four pounds from each other—the butter milk leading. The cost of fodder per pound of dressed pork produced amounts in Lot A (skim milk) to 5.8 cts., and in case of Lot B (butter milk) to 4.6 cts. This difference in cost corresponds quite closely with the difference in cost of the two kinds of milk. The dressed pork was sold at 7¼ cts. per pound. The value of manure produced will be reported on some later occasion, when actual values can be presented. The investigation is continued. Two breeds—Berkshire and Chester—are already on trial to turn to account the information received in the first experiment.

A.

SKIM MILK AND CORN MEAL.

I.

PERIODS.	Feed Consumed.		Weight of Animal, (lbs.)	Daily increase in live weight.
	Meal, (ozs.)	Skim Milk, (qts.)		
May 21—31, - -	100	58	41½	0 lb. 11 oz.
June 1—9, - -	132	54	60½	1 “ 0 “
“ 9—17, - -	128	48	67	0 “ 15 “
“ 17—24, - -	152	50	79¾	1 “ 13 “
“ 24—30, - -	160	54	89¾	1 “ 7 “
July 1—7, - -	210	70	101	1 “ 10 “
“ 7—14, - -	210	70	111½	1 “ 8 “
“ 14—22, - -	288	96	124¾	1 “ 14 “
“ 22—29, - -	252	84	140¾	2 “ 4 “
“ 29—Aug. 5, -	228	76	147¾	1 “ “
Aug. 5—12, - -	180	60	156½	1 “ 5 “
“ 12—19, - -	252	84	170	1 “ 15 “
“ 19—26, - -	252	84	183½	1 “ 15 “
“ 26—Sept. 2, -	258	86	188¼	0 “ 11 “
Sept. 2—9, - -	231	77	202¼	2 “ “
“ 9—16, - -	294	98	217¼	2 “ 2 2/7 “
“ 16—22, - -	210	70	228¾	1 “ 15 “

Total amount of feed consumed from May 21 to Sept. 22, 1884:

221 lbs. Corn Meal, equal to dry matter,	189.57 lbs.
1219 qts. Skim Milk, " " "	255.45 "
Total amount of dry matter,	454.02

Live weight of animal at beginning of experiment,	44.75 lbs.
Live weight at time of killing,	228.75 "
Live weight gained during experiment,	184 "
Dressed weight at the time of killing,	181.75 "
Loss in weight by dressing,	47 lbs., or 20.5 per cent.
Dressed weight gained during experiment,	146 lbs.

Cost of feed consumed during the experiment:

221 lbs. Corn Meal, at 1.4 cts.,	$3.09
305 gals. Skim Milk, at 2 cts. per gal.,	6.10
	$9.19

454 lbs. of dry matter fed, produced 184 lbs. of live weight, and 146 lbs. of dressed weight.

2.47 lbs. of dry matter yielded 1 lb. live weight; and 3.11 lbs. of dry matter yielded 1 lb. dressed weight.

Cost of feed, for production of 1 lb. of dressed pork, 6.3 cts.

A.

SKIM MILK AND CORN MEAL.

II.

PERIODS.	Feed Consumed.		Weight of Animal, (lbs.)	Daily increase in live weight.
	Meal, (ozs.)	Skim Milk, (qts.)		
May 21—31, - -	100	58	54½	0 lb. 12 oz.
June 1—9, - -	132	54	77	1 " 11 "
" 9—17, - -	192	64	87¼	1 " 7 "
" 17—24, - -	152	50	97¾	1 " 8 "
" 24—30, - -	160	54	109	1 " 10 "
July 1—7, - -	210	70	121¼	1 " 12 "
" 7—14, - -	210	70	130¾	1 " 6 "
" 14—22, - -	288	96	141¾	1 " 9 "
" 22—29, - -	252	84	154½	1 " 13 "
" 29—Aug. 5, -	228	76	162¾	1 " 3 "
Aug. 5—12, - -	180	60	167¼	0 " 10 "
" 12—19, - -	252	84	179	1 " 11 "
" 19—26, - -	252	84	190¾	1 " 11 "
" 26—Sept. 2, -	258	86	193⅓	0 " 7 "
Sept. 2—9, - -	294	98	211½	2 " 8 "
" 9—16, - -	294	98	221¾	1 " 8 "
" 16—22, - -	210	70	230¼	1 " 7 "

Total amount of feed consumed from May 21 to Sept. 22:

226½ lbs. Corn Meal, equal to dry matter,	197.92 lbs.
1256 qts. Skim Milk, " " "	263.21 "
Total amount of dry matter,	461.13

Live weight of animal at beginning of experiment,	54.50 lbs.
Live weight at time of killing,	230.25 "
Live weight gained during experiment,	175.75 "
Dressed weight at time of killing,	195 "
Loss in weight by dressing,	35.25 lbs., or 15.3 per cent.
Dressed weight gained during experiment,	148.84 lbs.

Cost of feed consumed during the experiment:

226½ lbs. Corn Meal, at 1.4 cts. per lb.,	$3.17
314 gals. Skim Milk, at 2 cts. per gal.,	6.28
	$9.45

461 lbs. of dry matter fed, produced 175.75 lbs. of live weight, and 148.84 lbs. of dressed weight.

2.63 lbs. of dry matter yielded 1 lb. live weight; and 3.08 lbs. dry matter yielded 1 lb. dressed weight.

Cost of feed, for production of 1 lb. of pork, 6.4 cts.

A.

SKIM MILK AND CORN MEAL.

III.

PERIODS.	Feed Consumed.		Weight of Animal, (lbs.)	Daily increase in live weight.
	Meal, (ozs.)	Skim Milk, (qts.)		
May 21—31, - -	100	58	50½	0 lb. 15 oz.
June 1—9, - -	132	54	74½	1 " 12 "
" 9—17, - -	192	64	85¾	1 " 10 "
" 17—24, - -	195	65	97¾	1 " 11 "
" 24—30, - -	195	65	114	2 " 5 "
July 1—7, - -	210	70	127¼	1 " 14 "
" 7—14, - -	252	84	145¼	2 " 9 "
" 14—22, - -	294	98	163	2 " 8 "
" 22—29, - -	294	98	181	2 " 9 "
" 29—Aug. 5, -	294	98	200¾	2 " 13 "
Aug. 5—12, - -	294	98	214½	1 " 15 "
" 12—19, - -	294	98	236	3 " 1 "
" 19—26, - -	294	98	250½	2 " 1 "
" 26—Sept. 2, -	300	100	257½	1 " 0 "
Sept. 2—9, - -	336	112	281¾	3 " 9 "
" 9—16, - -	336	112	293¾	1 " 12 "
" 16—22, - -	240	80	308½	2 " 7 "

Total amount of feed consumed from May 21 to Sept. 22:

265¾ lbs. Corn Meal, equal to dry matter,	231.78 lbs.	
1452 qts. Skim Milk, " " "	304.29 "	
Total amount of dry matter,	536.07	

Live weight of animal at beginning of experiment,		50.50 lbs.
Live weight at time of killing,		308.50 "
Live weight gained during experiment,		258 "
Dressed weight at time of killing,		257.25 "
Loss in weight by dressing,	51.25 lbs.,	16.64 per cent.
Dressed weight gained during experiment,		215.15 lbs.

Cost of feed consumed during the experiment:

265¾ lbs. Corn Meal, at 1.4 cts. per lb.,	$3.72
363 gals. Skim Milk, at 2 cts. per gal.,	7.26
	$10.98

536 lbs. of dry matter fed, produced 258 lbs. of live weight, and 215.15 lbs. dressed weight.

2.8 lbs. of dry matter yielded 1 lb. of live weight; and 2.5 lbs. of dry matter yielded 1 lb. of dressed weight.

Cost of feed, for production of 1 lb. of pork, 5.11 cts.

B.

BUTTER MILK AND CORN MEAL.

I.

PERIODS.	Feed Consumed.		Weight of Animal, (lbs.)	Daily increase in live weight.
	Meal, (ozs.)	Butter Milk, (qts.)		
May 21—31, - -	100	58	48¼	0 lb. 11 oz.
June 1—9, - -	132	54	66	1 " 6 "
" 9—17, - -	192	64	77½	1 " 7 "
" 17—24, - -	152	50	87½	1 " 7 "
" 24—30, - -	160	54	98½	1 " 9 "
July 1—7, - -	210	70	107¾	1 " 5 "
" 7—14, - -	210	70	120¾	1 " 14 "
" 14—22, - -	288	96	131½	1 " 8 "
" 22—29, - -	252	84	143¾	1 " 12 "
" 29—Aug. 5, -	192	68	153¾	1 " 7 "
Aug. 5—12, - -	168	56	160¾	1 " 0 "
" 12—19, - -	252	84	172½	1 " 11 "
" 19—26, - -	252	84	183¼	1 " 8 "
" 26—Sept. 2, -	258	86	185	0 " 4 "
Sept. 2—9, - -	294	98	206¼	3 " 0 "
" 9—16, - -	294	98	219¼	1 " 14 "
" 16—22, - -	294	70	230½	1 " 14 "

Total amount of feed consumed from May 21 to Sept. 22:

226 lbs. Corn Meal, equal to dry matter,	197.48 lbs.
1244 qts. Butter Milk, ‘‘ ‘‘ ‘‘	190.33 ‘‘
Total amount of dry matter,	387.81

Live weight of animal at beginning of experiment,	48.25 lbs.
Live weight at time of killing,	230.50 ‘‘
Live weight gained during the experiment,	182.25 ‘‘
Dressed weight at time of killing,	190.75 ‘‘
Loss in weight by dressing,	39.75 lbs., or 17.3 per cent.
Dressed weight gained during experiment,	150.85 lbs.

Cost of feed consumed during the experiment:

226 lbs. Corn Meal, at 1.4 cts. per lb.,	$3.16
311 gals. Butter Milk, at 1.37 cts. per gal.,	4.26
	$7.42

387.8 lbs. of dry matter fed, produced 182.25 lbs. of live weight, and 150.85 lbs. of dressed weight.

2.12 lbs. of dry matter yielded 1 lb. of live weight; and 2.57 lbs. of dry matter yielded 1 lb. of dressed weight.

Cost of feed, for production of 1 lb. of pork, 4.92 cts.

B.
BUTTER MILK AND CORN MEAL.
II.

PERIODS.	Feed Consumed.		Weight of Animal, (lbs.)	Daily increase in live weight.
	Meal, (ozs.)	Butter Milk, (qts.)		
May 21—31, - -	100	58	45½	0 lb. 12 oz.
June 1—9, - -	132	54	67½	1 ‘‘ 7 ‘‘
‘‘ 9—17, - -	192	64	79½	1 ‘‘ 11 ‘‘
‘‘ 17—24, - -	152	50	89¾	1 ‘‘ 6 ‘‘
‘‘ 24—30, - -	160	54	100	1 ‘‘ 7 ‘‘
July 1—7, - -	210	70	111	1 ‘‘ 9 ‘‘
‘‘ 7—14, - -	210	70	123¾	1 ‘‘ 3 ‘‘
‘‘ 14—22, - -	288	96	135½	1 ‘‘ 11 ‘‘
‘‘ 22—29, - -	252	84	147¼	1 ‘‘ 11 ‘‘
‘‘ 29—Aug. 5, -	192	68	158	1 ‘‘ 8 ‘‘
Aug. 5—12, - -	168	56	163¾	0 ‘‘ 13 ‘‘
‘‘ 12—19, - -	252	84	177	1 ‘‘ 14 ‘‘
‘‘ 19—26, - -	252	84	189½	1 ‘‘ 12 ‘‘
‘‘ 26—Sept. 2, -	258	86	189	—1⅐ ‘‘
Sept. 2—9, - -	294	98	211¾	3 ‘‘ 4 ‘‘
‘‘ 9—16, - -	294	98	226¼	2 ‘‘ 1 ‘‘
‘‘ 16—22, - -	210	70	238	1 ‘‘ 15 ‘‘

Total amount of feed consumed from May 21 to Sept. 22:

226 lbs. Corn Meal, equal to dry matter,	197.48 lbs.
1244 qts. Butter Milk, " " "	190.33 "
Total amount of dry matter,	387.81

Live weight of animal at beginning of experiment,	45.50 lbs.
Live weight at time of killing,	238 "
Live weight gained during experiment,	192.50 "
Dressed weight at time of killing,	199.25 "
Loss in weight by dressing,	38.75 lbs., or 16.3 per cent.
Dressed weight gained during the experiment,	161.2 lbs.

Cost of feed consumed during the experiment:

226 lbs. Corn Meal, at 1.4 cts. per lb.,	$3.16
311 gals. Butter Milk, at 1.37 cts. per gal.,	4.26
	$7.42

387.8 lbs. of dry matter fed, produced 192.50 lbs. live weight, and 161.2 lbs. dressed weight.

2.01 lbs. of dry matter yielded 1 lb. of live weight; and 2.4 lbs. of dry matter yielded 1 lb. of dressed weight.

Cost of feed, for production of 1 lb. of pork, 4.64 cts.

B.

BUTTER MILK AND CORN MEAL.

III.

PERIODS.	Feed Consumed.		Weight of Animal, (lbs.)	Daily increase in live weight.
	Meal, (ozs.)	Butter Milk, (qts.)		
May 21—31, - -	100	58	49	0 lb. 11 oz.
June 1—9, - -	132	54	72	1 " 10 "
" 9—17, - -	192	64	85¼	1 " 14 "
" 17—24, - -	195	65	98	1 " 13 "
" 24—30. - -	195	65	109¼	1 " 10 "
July 1—7, - -	210	70	121¾	1 " 12 "
" 7—14, - -	252	84	133¼	1 " 10 "
" 14—22, - -	294	98	151½	2 " 10 "
" 22—29, - -	294	98	167	2 " 3 "
" 29—Aug. 5, -	294	98	186¼	2 " 12 "
Aug. 5—12, - -	294	98	199¾	1 " 15 "
" 12—19, - -	294	98	218½	2 " 11 "
" 19—26, - -	294	98	227¾	1 " 5 "
" 26—Sept. 2, -	300	100	233½	0 " 13 "
Sept. 2—9, - -	336	112	259	3 " 11 "
" 9—16, - -	336	112	281	3 " 2 "
" 16—22, - -	240	80	293¼	2 " 1 "

Total amount of feed consumed from May 21 to Sept. 22:

$265\frac{3}{4}$ lbs. Corn Meal, equal to dry matter,	232.21 lbs.
1452 qts. Butter Milk, " " "	222.16 "
Total amount of dry matter,	454.37

Live weight of animal at beginning of experiment,	49 lbs.
Live weight at time of killing,	$293\frac{1}{4}$ "
Live weight gained during experiment,	$244\frac{1}{4}$ "
Dressed weight at time of killing,	243 "
Loss in weight by dressing,	50 lbs., or 17 per cent.
Dressed weight gained during experiment,	202.3 lbs.

Cost of feed consumed during the experiment:

$265\frac{3}{4}$ lbs. Corn Meal, at 1.4 cts. per lb.,	$3.72
363 gals. Butter Milk, at 1.37 cts. per gal.,	4.98
	$8.70

454.37 lbs. of dry matter fed, produced $244\frac{1}{4}$ lbs. of live weight, and 202.3 lbs. dressed weight.

1.86 lbs. of dry matter yielded 1 lb. of live weight; and 2.23 lbs of dry matter yielded 1 lb. of dressed weight.

Cost of feed, for production of 1 lb. of pork, 4.3 cts.

SUMMARY OF RESULTS OF EXPERIMENTS.

A. Pigs fed with Skim Milk and Corn Meal.

	Corn Meal, in pounds.	*Skim Milk, in gallons.*	*Live weight gained during experiment.*	*Dressed weight gained during experiment.*
I.	221	305	184	146
II.	$226\frac{1}{2}$	314	$175\frac{3}{4}$	$148\frac{4}{5}$
III.	$265\frac{3}{4}$	363	258	$215\frac{1}{5}$
	$713\frac{1}{4}$	982	$617\frac{3}{4}$	510

B. Pigs fed with Creamery Butter Milk and Corn Meal.

	Corn Meal, in pounds.	*Butter Milk, in gallons.*	*Live weight gained during experiment.*	*Dressed weight gained during experiment.*
I.	226	311	$182\frac{1}{4}$	$150\frac{9}{10}$
II.	226	311	$192\frac{1}{2}$	$161\frac{2}{10}$
III.	$265\frac{3}{4}$	363	$244\frac{1}{4}$	$202\frac{3}{10}$
	$717\frac{3}{4}$	985	619	$514\frac{4}{10}$

Total cost of feed consumed during the experiment.

A.	$713\frac{1}{4}$ lbs. Corn Meal,	$9.98
	982 gals. Skim Milk,	19.64
		$29.62
B.	$717\frac{3}{4}$ lbs. Corn Meal,	$10.04
	985 gals. Butter Milk,	13.50
		$23.54

Cost of feed per pound of dressed pork produced.

A.	Skim Milk and Meal,	5.8 cts.
B.	Butter Milk and Meal,	4.6 cts.

The difference in cost is approximately equal to the difference in cost of the Butter Milk and Skim Milk.

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241. Analyses of Skim Milk, from the Experiment Station Farm.

	I.	*II.*	*III.*	*Mean.*
Water.	90.20	90.42	90.64	90.42
Solids,	9.80	9.58	9.36	9.58
Fat (in solids),	.68	.32	.18	.39
Casein (nitrogenous matter, in solids,)		3.23		3.23

Nutritive Ratio, 1 : 2.15.

These analyses represent the kind of skim milk fed during the previously described feeding experiment. One quart weighed, 35 ounces; and contained 3.35 ounces of solid (dried) matter.

242. Analyses of Butter Milk, from the Amherst Co-operative Creamery Association.

	I.	*II.*	*III.*	*Mean.*
Water,	92.79	92.76	93.17	90.90
Solids,	7.21	7.24	6.83	7.09
Fat (in solids),	.20	.22		.21
Casein (nitrogenous matter, in solids),		2.9		2.90

Nutritive Ratio, 1 : 1.63.

These analyses were made at the same date, when the skim milk tests were carried out—and represent as far as practicable the quality of butter milk fed during above described feeding trial. One quart of butter milk weighed 34 ounces, and contained 2.41 ounces of solid matter (dried).

243. CORN MEAL.

92.34 per cent. passed through mesh 144 to the square inch.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	12.62	252.4			
Dry Matter, ...	87.38	1747.6			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	1.56	31.2			1 : 8.68
" Cellulose, ...	2.65	53.0	18.06	34	
" Fat, ...	4.27	85.4	64.90	76	
" Protein, (nitrogenous matter),	11.43	228.6	194.31	85	
Non-nitrogenous extract matter, . .	80.09	1601.8	1505.69	94	
	100.00	2000.00	1782.96		

This article represents the average composition of the corn meal fed in connection with skim milk and butter milk in the feeding experiments, with pigs, described in the previous pages, BULLETIN 13.

244. WHEAT BRAN.

From John L. Holley, South Amherst, Mass.

13.71 per cent. passed through mesh 144 to the square inch.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	10.48	209.6			
Dry Matter, ...	89.52	1790.4			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					1 :3.25
Crude Ash, ...	6.98	139.6			
" Cellulose.	10.20	204.0	40.80	20	
" Fat, ...	4.77	95.4	76.32	80	
" Protein, (nitrogenous matter),	20.24	404.8	356.22	88	
Non-nitrogenous extract matter, . .	57.81	1156.2	924.96	80	
	100.00	2000.00	1398.30		

The article sold at $23.00 at the mill. This quality of wheat bran has been fed during the feeding experiments with milch cows reported in BULLETIN 12.

245. TIMOTHY HAY.

From the grounds of the Experiment Station, June 20, 1884.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	10.55	211.0			
Dry Matter,	89.45	1789.0			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	4.69	93.8			1 : 10.6
" Cellulose,	29.21	584.2	338.84	58	
" Fat,	2.65	53.0	24.38	46	
" Protein, (nitrogenous matter),	9.02	180.4	102.83	57	
Non-nitrogenous extract matter,	54.43	1088.6	685.82	63	
	100.00	2000.00	1151 87		

The grass was cut at the close of the blooming period, and the hay is a fair article of its kind. It served during the feeding experiment with milch cows described in the previous BULLETIN No. 12.

FERTILIZER ANALYSES.

246. NOVA SCOTIA PLASTER.

(Gypsum.)

Collected of R. T. Prentiss, Holyoke, Mass.

247. ONONDAGA PLASTER.

(Gypsum.)

Collected of Sheldon & Newcomb, Greenfield, Mass.

	246.	*247.*
	Pounds per hundred.	
Calcium oxide,	32.17	29.15
Magnesium oxide,	1.40	3.89
Sulphuric acid,	44.00	31.82
Insoluble matter,	.70	9.25

The sample (246) contains 94.8 per cent. of gypsum, and is a fair article. The customary market price in our vicinity is $9.00 per ton.

This second article (247) sells at $6.00 per ton; its cost corresponds well with its percentage of gypsum,—67. to 68. per cent.

WOOD ASHES.

248. Canada Ashes, collected of Mr. Roche, South Deerfield, Mass.

249. Canada Ashes, collected of A. Montague, Sunderland, Mass.

250. Ashes, sent on for examination, by H. C. Haskell, Deerfield, Mass.

251. Ashes, sent on for examination, from Northfield, Mass.

	248.	*249.*	*250.*	*251.*
		Pounds per hundred.		
Moisture at 100° C.,	10.72	15.00	15.37	27.47
Calcium oxide,	40.88	35.22	35.65	30.50
Magnesium oxide,	3.33	3.24	2.38	2.81
Potassium oxide,	4.95	5.50	3.64	1.25
Phosphoric acid,	2.02	2.53	2.11	1.98
Insoluble matter,	6.30	9.05	7.95	10.55

Samples 248 and 249, are of a fair composition; 250 contains less potash, and may consist in part of leached ashes; 251 is a leached ash. Wood ash ought to be bought and sold on guaranty of composition; inferior wood ashes are liable to come from all sections of the country.

C. A. GOESSMANN, *Director*,

AMHERST, MASS.

☞*P. S. The Bulletins of the Experiment Station will be sent free of charge to all parties interested in its work, on application.*

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AGRICULTURAL EXPERIMENT STATION.

BULLETIN No. 14.

MARCH, 1885.

The publication of bulletins, which for economical reasons was discontinued in November, is herewith resumed, to assist in the farm work of the coming season. The results of investigations carried on at the Station towards the close of the past, and at the beginning of the present year, are incorporated in the second annual report of the institution which is contained in the last annual report of the Secretary of the State Board of Agriculture; those of a later date, including some feeding experiments and chemical inquiries of various description, will be published as speedily as circumstances permit.

Arrangements are made to attend to the examination of objects of general interest to the farming community, to the full extent of existing resources. Requests for analyses of substances—as fodder articles, fertilizers, etc.—coming through officers of agricultural societies and farmer's clubs within the state, will receive hereafter, as in the past, first attention, and in the order that the applications arrive at the office of the Station. The material for examination ought to be sent on, transportation prepaid. The results will be returned without a charge for the services rendered. Application of private parties for analyses of substances, free of charge, will receive a careful consideration, whenever the results promise to be of a more general interest, and so far as the present quite limited pecuniary means admit. For obvious reasons no work can be carried on at the Station, of which the results are not at the disposal of the managers for publication, if deemed advisable in the interest of the citizens of the state.

The bulletins to be issued from time to time will be sent in the future, as they have been in the past, free of charge to the agricultural press, the various agricultural associations in the state, and all parties interested in its work, whose names are on our list of regular recipients. New applications will receive, as far as practicable, prompt attention. Parties connected with the publication of agricultural topics, will confer a favor on the institution by sending on a copy.

All parcels and communications sent on to the "The Experiment Station" must have express and postal charges prepaid, to receive attention.

Meteorological Summary for the month ending February 28th.

	December.	*January.*	*February.*
Mean temperature,	28.21°	22.73°	15.17°
Highest temperature,	57.00°	57 00°	39.00°
Lowest temperature,	—20.00°	—18.00°	—15.00°
Mean Relative Humidity,	——	81.70 per ct.	81.65 per ct.
Total Rainfall or melted snow, (in.),	4.85	3.78	3.88
Total Snow fall, (in.),	14.75	13.80	7.88
Prevailing Winds,	Northerly;	Northwesterly;	Northwesterly.
No. of days on which 0.01 in. or more of rain or melted snow fell,	7.	10.	7.
No. of days on which cloudiness averaged 8 or more on scale of 10,	11.	8.	2.

During the three months the "cold wave" flag has been displayed ten times, in accordance with notice received from the Signal Service, and only once has the warning failed to be justified by a marked fall of temperature during the succeeding twenty-four hours.

FODDER AND FODDER ANALYSES.

On a previous occasion, attention has been called to the circumstance that experiments have been instituted at an early date at the Station, to study the adaptability, to our soil and climate, of some reputed forage crops of the valuable family of plants, Leguminosae, of which the clover, the peas, and the beans are so conspicuous representatives. Some observations during 1883, with Cow Peas, Vetches, and Serradella have been reported during the past year in BULLETINS 8 and 9; others of a more recent date, with Common Lucern, (Alfalfa), Horse Bean and Lupine, will be briefly described within these pages. The early stage of our experiments obliges us, however, to confine ourselves for the present, to a mere introduction of the subject, by describing the quality of the crops we raised.

A successful introduction of a greater variety of valuable farm crops tends to improve our chances for economical rotations of crops. The cultivation of valuable fodder crops maturing at different periods of the growing season, assist in the compounding of economical fodder rations. The best interests of the dairy business and of stock feeding in general, call for a more efficient protection against the serious influence of dry seasons. To meet the shortcomings of hill pastures and dry meadows, by feeding a half-matured fodder corn, is decidedly wasteful. The nutritive value of one and the same variety of fodder corn may be impaired, ton for ton, from fifty to seventy and more per cent. in consequence of a too early cutting for green fodder or for ensilage.

A more liberal choice of fodder crops growing successfully upon different kinds of soil, and maturing at different periods of the season, will prove, as it has proved elsewhere, most beneficial in the interest of an economical farm management.

252. WHITE LUPINE. (Lupinus Albus).

Collected when in bloom from Experimental Plats of the Station, 1884.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	8.60	172.00			
Dry Matter,	91.40	1828.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	5.03	100.60			1 : 4.27
" Cellulose,	31.18	623.60	455.23	73	
" Fat,	2.41	48.20	14 46	30	
" Protein, (nitrogenous matter),	18.71	374.20	276.91	74	
Non-nitrogenous extract matter,	42.67	853.40	512.04	60	
	100.00	2000.00	1258.64		

The cultivation of this variety of Lupine has been undertaken for the purpose of testing its fitness for green manuring upon exhausted farm-lands. The frequent occurrence of a natural dense growth of a blue variety of wild Lupine, on sandy unproductive lands along the Connecticut river, suggested the idea of trying the above described improved variety, as a green manure, for the reclamation of abandoned farm-lands in neighboring districts. The white Lupine enjoys a high reputation as a green manure upon a light, dry, sandy soil. The first season has been used for raising seed.

253. LUCERN. (Alfalfa). (Medicago sativa).

Collected when just beginning to bloom, from Plats of the Station—
July 2d, 1884.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	16.00	320.00			
Dry Matter, ...	84.00	1680.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					1 : 4.71
Crude Ash, ...	10 45	209.00			
" Cellulose, ...	25.42	508.40	203.36	40	
" Fat, ...	2.50	50.00	19.50	39	
" Protein, (nitrogenous matter),	16.34	326.80	251.64	77	
Non-nitrogenous extract matter, . .	45 29	905.80	588.77	65	
	100.00	2000.00	1063.27		

The green material contained 77 parts of moisture and 23 parts of vegetable matter. The sample for analysis was taken from the first growth, when in blossom. The composition of the Lucern hay compares favorably with that of a first class hay of red clover in blossom. The past winter will have tested severely the adaption of this valuable fodder plant to our climate. The plant is noted for its resistance to drought wherever its extensive root system freely develops.

254. HORSE BEAN. (Horse Bean). Straw.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	9.15	183.00			
Dry Matter, ...	90.85	1817.00		In case of cows.	
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					1 : 8.56
Crude Ash, ...	9.59	191.80			
" Cellulose, ...	41.44	828.80	298.37	36	
" Fat, ...	1.51	30.20	16.61	55	
" Protein, (nitrogenous matter),	9.69	193.80	98.84	51	
Non-nitrogenous extract matter, . .	37.77	755.40	460.79	61	
	100.00	2000.00	874.61		

(Horse Bean). Beans.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	10.28	205.60		In case of cows.	1 : 2.24
Dry Matter, ...	89.72	1794.40			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	4.27	85.40			
" Cellulose, ...	8.11	162.20	102.19	63	
" Fat, ...	1.11	22.20	21.53	97	
" Protein, (nitrogenous matter),	30.03	600.60	540.54	90	
Non-nitrogenous extract matter, . .	56.48	1129.60	1061.82	94	
	100.00	2000.00	1726.08		

This plant is extensively cultivated throughout Europe either alone or as a mixed crop with oats, barley or rye, for green fodder. The tender parts of the stems and the beans are noted for their high nutritive value. The best results are obtained upon clayish soils and on good marsh-lands. The first year's results with Horsebean, Lupine and Lucern, have been quite encouraging.

255. HAMPDEN PROLIFIC CORN.

(Sent on for examination from Springfield, Mass).

The ears contained from eighteen to twenty rows of kernels; were of a whitish color; and had an average length of from 9 3-4 to 10 inches. They consisted in weight of from 86.5 to 88.2 per cent. of kernels, and from 21.8 to 23.5 per cent. of cobs. The average weight of the ears sent on, varied from 473.4 to 491.4 grammes (about one pound); that of a single kernel, from .39 to .43 grammes. The moisture amounted to from 8.02 to 11.43 per cent.

No. 1 was raised upon a sandy loam, in good condition.

No. 2 was raised upon a heavy soil, in good condition, according to statements made.

	No. 1.	No. 2.
Moisture of kernels,	11.43	8.02
Dry Matter,	88.57	91.98
	100.00	100.00

ANALYSIS OF DRY MATTER.

Crude Ash,	1.72	1.69
" Cellulose.	2.17	1.98
" Fat,	4.52	5.29
Protein (nitrogenous matter),	11.36	13.73
Non-nitrog. extract matter,	80.23	77.31
	100.00	100.00

The analysis of this variety of corn furnishes an additional illustration of the influence of fitness and condition of soil on the composition of one and the same kind of crop, under similar climatical conditions. The corn No. 2 contains nearly one-fifth or 20 per cent. more fat and nitrogenous compounds—the most costly constituents—than sample No. 1. A comparison of the above stated analytical results, with the analyses of prominent varieties of corn raised within the state, shows that as far as composition is concerned, the Hampden Prolific Corn may be counted of equal value with our home standard articles. For details I refer to an article "On Relative Value of Several Prominent Varieties of Eastern, Western and Southern Corn," published in the annual report of the Secretary of the Massachusetts State Board of Agriculture for 1879, page 221—250.

To manure our farm crops well, pays, as a rule, not less in regard to the improvement in quality than in the increase of quantity.

256. MIDDLINGS.

Sent on by Bolton Farmers' and Mechanics' Association, Bolton, Mass.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	9.25	185.00	Not determined by actual feeding tests.	Not determined by actual feeding tests.	1 : 4.74—1 : 5
Dry Matter,	90.75	1815.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	5.34	106.80			
" Cellulose,	8.40	168.00			
" Fat,	6.46	129.20			
" Protein, (nitrogenous matter),	18.18	363.60			
Non-nitrogenous extract matter,	61.62	1232.40			
	100.00	2000.00			

The article is rich in valuable constituents for feeding purposes, and compares favorably with those of its kind. It seems quite safe to assume the rates of digestibility noticed in wheat bran, fed to cattle, which have been repeatedly stated in previous bulletins:—see No. 11, page 5.

VALUATION OF FERTILIZERS

AND

ANALYSES OF FERTILIZERS.

The valuation of a fertilizer is based on the trade value of the fertilizing elements specified by analysis. The commercial, or money value of the higher grades of agricultural chemicals and of the higher priced, more or less compound fertilizers, depends in the majority of cases on the amount and the particular form of two or three essential articles of plant food, i. e., phosphoric acid, nitrogen and potash, which they contain; and on the market price of these constituents at the time of sale. The valuation which usually accompanies the analyses of these goods shall inform the consumer, as far as practicable, regarding the price at which the several specified essential elements of plant food, in an efficient form, have been offered of late, for sale, in the general market.

The market value of low priced materials used for manurial purposes, as salt, ashes, various kinds of lime, barnyard manure, factory refuse and waste materials of different description, does, quite frequently, not stand in a close relation to their chemical composition. Their cost varies in different localities. Local facilities for cheap transportation and more or less advantageous mechanical condition for direct application and for a speedy action, exert, as a rule, a decided influence on their selling-price.

The modes of analyses generally adopted for the examination of fertilizing ingredients, are practically the same in different parts of the country. The results obtained by ordinary care, wherever the identity of the material for examination has been secured, answer the main purpose,—to assist in an intelligent management of the trade in commercial fertilizers.

The wholesale market price of manurial substances is liable to serious fluctuations; for supply and demand exert here, as well as in other branches of commercial industry, a controlling influence on their temporary money value. As farmers have, only in exceptional instances, a desirable chance to inform themselves regarding the conditions which control the market price, the assistance rendered in this direction, by Agricultural chemists charged with the examination of commercial fertilizers, cannot otherwise than benefit, ultimately, both farmers and manufacturers.

The market reports of centres of trade in New England, New York and New Jersey, aside from consultations with leading manufacturers of fertilizers, furnish us the necessary information regarding the current trade value of fertilizing ingredients. The subsequent statement of trade values is obtained by taking the average of the wholesale quotations in New York and Boston, during the six months preceding March 1st, 1885, and increasing them by 20 per cent., to cover expenses for sales, credits, etc. They are recognized and accepted by the experiment stations of Connecticut, Massachusetts and New Jersey.

TRADE VALUES OF FERTILIZING INGREDIENTS IN RAW MATERIALS AND CHEMICALS.

	Cents per pound.	
	1884.	*1885.*
Nitrogen in Ammonia Salts,	22	18
“ Nitrates,	18	18
“ Dried and fine ground fish,	20	18
Organic nitrogen in guano and fine ground blood and meat,	18	18
Organic nitrogen in cotton seed, linseed meal and in castor pomace,	18	18
Organic nitrogen in fine ground bone,	18	18
Organic nitrogen in fine medium bone,	16	16
Organic nitrogen in medium bone,	14	14
Organic nitrogen in coarse medium bone,	12	12
Organic nitrogen in coarse bone, horn shavings, hair, and fish scraps,	10	10
Phosphoric acid soluble in water,	10	9
“ “ “ ammonia citrate,*	9	8
Phosphoric acid insoluble, in dry fine ground fish, and in fine bone,	6	6
Phosphoric acid insoluble, in fine medium bone,	5½	5½
Phosphoric acid insoluble, in medium bone,	5	5
“ “ “ coarse medium bone,	4½	4½
“ “ “ coarse bone,	4	4
“ “ “ fine ground rock phosphate,	2¼	2
Potash, as high grade sulphate,	7¼	7¼
“ Kainite,	4¼	4¼
“ Muriate,	4¼	4¼

The above trade values are the figures at which, on March 1st, the respective ingredients could be bought at retail, for cash in our markets in the *raw materials*, which are the regular source of supply.

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*Dissolved from two grams of Phosphate, unground, by 100 C. C. neutral solution of ammonium citrate sp gr. 1.09 in 30 minutes at 65° C., with agitation once in five minutes; commonly called “reverted” or “backgone” phosphoric acid.

They also correspond, as has been stated, to the average wholesale prices for the six months ending March 1st, plus 20 per cent. in case of goods for which we have wholesale quotations. The calculated values obtained by the use of the above figures, will be found to agree fairly with the reasonable retail price in case of standard raw materials such as:

Sulphate of Ammonia,	Azotin,
Nitrate of Soda,	Dry Ground Fish,
Muriate of Potash,	Cotton Seed,
Sulphate of Potash,	Castor Pomace,
Dried Blood,	Bone,

Plain Superphosphates.

TRADE VALUES IN SUPERPHOSPHATES, SPECIAL MANURES AND MIXED FERTILIZERS OF HIGH GRADE.

The organic nitrogen in these classes of goods will be reckoned at the highest figure laid down in the Trade Values of Fertilizing Ingredients in Raw Materials, namely eighteen cents per pound.

Insoluble phosphoric acid will be reckoned at four cents, the cost of phosphoric acid in coarse bones. Potash at four and one-quarter cents, if sufficient chlorine is present in the fertilizer to combine with it. If there is more potash present than will combine with chlorine, then this excess of potash will be reckoned as sulphates. To introduce large quantities of chlorides, common salt, etc., into fertilizer, claiming sulphate of potash as a constituent, is a practice, which in our present state of information will be considered of doubtful merits.

The use of the highest trade values is but justice to these articles in which the costliest materials are expected to be used. In most cases the calculated value of ammoniated superphosphates and specials will fall considerably below the retail price. The difference between the two, will represent the manufacturer's charges for converting raw materials into more or less compounded manufactured articles. These charges include grinding and mixing, bagging or barreling, storage and transportation, commission to agents or dealers, long credit, interest on investment, bad debts, and finally profits.

The prices stated in these bulletins in connection with analyses of commercial fertilizers refer to their cost per ton of 2,000 pounds, on board of car or boat near the factory, or place for general distribution.

The *mechanical condition* of any fertilizing material, simple or compound, deserves the most serions consideration of farmers, when articles of a similar chemical character are offered for their choice. The degree of pulverization controls, almost without exception, under similar conditions, the rate of solubility, and the more or less rapid diffusion of the different articles of plant-food throughout the soil.

The *state of moisture* exerts a no less important influence on the pecuniary value, in case of one and the same kind of substance.

Two samples of fish fertilizer, although equally pure, may differ from 50 to 100 per cent. in commercial value, on account of mere difference in moisture.

As existing laws of the State for control of the trade in commercial fertilizers provides for the examination of licensed articles, the attention of the Station has been directed mainly towards the examination of agricultural chemicals, the crude stock for the manufacture of commercial fertilizers, and of prominent refuse materials from manufacturing industries and elsewhere.

Crude stock for the manufacture of fertilizers, and refuse material of various descriptions, sent to the Station for examination, are valued with reference to the market prices of their principal constituents, taking into consideration at the same time their general fitness for speedy action.

A large percentage of commercial fertilizing material consists of refuse matter from various industries. The composition of these substances depends on the mode of manufacture carried on. The rapid progress in our manufacturing industry is liable to affect at any time, more or less seriously, the composition of the refuse. A constant inquiry into the character of the agricultural chemicals, and of commercial manurial refuse substances offered for sale, cannot fail to secure confidence in their composition, and to diminish financial disappointment in consequence of their application.

This work is carried on at the Station for the purpose of aiding the farming community in a clear and intelligent appreciation of these substances for manurial purposes.

General experience in farm practice teaches that it is safer, for economical reasons, to use commercial fertilizers rather as supplements, than as substitutes for barn-yard manures.

The advantages arising from the introduction of chemical and commercial manurial substances, can only be secured to their full extent when applied with reference to actual local wants of the soil, and to special requirements of the crops under cultivation.

It has been the aim in previous bulletins of the Station, to describe briefly,—in connection with analytical reports regarding the composition,—also the peculiar character and the special merits of prominent agricultural chemicals, and of refuse materials of various industries, which are used for the manufacture of fertilizers for farm purposes.

This feature of the bulletins will be retained for the future, wherever an inducement is offered. The information thus far given on these occasions may be improved by studying the official annual reports on Commercial Fertilizers, published since 1873, in the Report of the Secretary of the State Board of Agriculture; and in the first and second Annual Reports of the Station. A knowledge of the sources and of the character of the ingredients which serve largely for the manufacture of our commercial fertilizers, leads quite naturally to a due appreciation of the importance of securing *the proper form* for our circumstances. No mode of supplying our special wants of plant food for a successful and economical cultivation of crops is as safe, as the practice to supplement—if needed—our home-made manures with commercial fertilizing ingredients, in the form of suitable raw materials and chemicals to meet our wants; and if obliged to increase our home resources of manure, to compound them from the most suitable stock in the market. Although a first trial of that course of action may not realize all the advantages expected, there can be no doubt about the correctness of the statement, that the best financial success on the part of the farmer, can ultimately only be secured by the gradual adoption of that system of manuring the farm.

Our leading dealers in fertilizers begin to realize the late tendency in their trade, and are preparing to meet the call. There is every reason to assume that the consumption of commercial manurial matter will increase in the same proportion, as the principles of a rational and economical system of manuring become better understood.

Consumers of commercial manurial substances do well to buy whenever practicable, on a guaranty of composition with reference to their essential constituents; and to see to it that the bill of sale recognizes that point of the bargain. Any mistake or misunderstanding in the transaction may be readily adjusted, in that case, between the contending parties.

257. SUMAC.

Waste material from tanneries in Peabody, Mass. Sent on by the Mass. Society for Promoting Agriculture.

Moisture at 100° C.,	63.06
Organic matter,	36.94
Nitrogen in organic matter,	1.19
Crude Ash in " "	6.80
Calcium oxide in ash,	1.14
Magnesium oxide in ash,	3.25
Potassium oxide " "	.17
Phosphoric acid,	.17
Insoluble matter in ash,	2.25

The nitrogen, potash and phosphoric acid contained in the above article represent a commercial value of $3.50 to $4 per ton of 2000 pounds. The tanning principle was so completely abstracted, that a composting with some air slacked lime, promises to render the material quite valuable as a manurial substance for light soils deficient in organic matter.

258. KENTUCKY TOBACCO STEMS. (Ground).

Sent on for examination.

	Per Cent.
Moisture at 100° C.,	12.18
Dry matter,	87.82
Nitrogen (in organic matter),	2.616

Potassium oxide,	8.816
Magnesium oxide,	1.395
Calcium oxide,	3.720
Phosphoric acid,	.726

This article is valuable for fertilizing purposes,—and deserves the special attention of tobacco-growers; its trade value of fertilizing constituents amounts from $15.50 to $16 per ton of 2000 lbs. at current rates of valuation.

259. Material taken from a Ditch in a Diked Marsh at East Salisbury, Mass. Sent on for examination:

	Per Cent.
Moisture at 100° C.,	33.40
Organic and Volatile Matter,	92.15
Ash,	7.85
Ash soluble,	4.20
Ash insoluble,	3.65
Nitrogen (in organic matter),	1.64
Phosphoric acid,	0.13
Potassium oxide,	0.26
Calcium oxide,	1.24

This material is quite rich in manurial substances, and equal in that respect to the better quality of peat.

260. LIME KILN ASHES.

(Collected at Holyoke, Mass.).

	Per Cent.
Moisture at 100° C.,	30.70
Calcium oxide,	37.55
Magnesium oxide,	3.68
Potassium oxide,	1.70
Phosphoric acid,	1.27
Carbonic acid,	17.83
Insoluble matter,	3.30

Sold at 22 cents per bushel.

The material is a fair sample of its kind.

261. SALTPETER WASTE.

Sent on from Acton, Mass.

	Per Cent.
Moisture at 100° C.,	0.50
Sodium oxide,	44.93
Potassium oxide, (largely chloride)	4.65
Nitrogen (in nitrates),	1.87

The sample represents a trade value from $10 to $11 per ton, and will prove quite effective upon grass lands and in case of forage crops in general.

C. A. GOESSMANN, *Director*,

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COLLEGE OF AGRICULTURE.

MASSACHUSETTS STATE

AGRICULTURAL EXPERIMENT STATION.

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BULLETIN No. 1[illegible]

APRIL, 188[illegible].

Meteorological Summary for two months ending April 30th.

	March.	April.
Highest Temperature,	50.0°	83.0°
Lowest Temperature,	11.0°	19.0°
Mean Temperature,	23.29°	45.29°
Mean Relative Humidity,	85.3 per ct.	72.6 per ct.
Total rainfall or melted snow,	0.86 in.	3.38 in.
Prevailing winds,	Northwesterly.	Northwesterly.
No. of days on which 0.01 inch of rain or melted snow fell,	4	6
No. of days on which cloudiness averaged 8 or more on scale of 10,	4	5

The month of March was characterized by unusually low temperature and slight precipitation. The mean temperature for the month was less than the average for forty-eight years, and the precipitation showed a decrease of 2.27 inches from the mean. In April the temperature rose to the opposite extreme, being unusually high towards the close of the month.

262. NOTES ON FEEDING EXPERIMENTS WITH MILCH COWS.

The experiments briefly described in a few subsequent pages were carried on for the purpose of ascertaining, under otherwise fairly corresponding circumstances, the economy of several customary combination of fodder articles—as far as the cost of the feed and the quantity and quality of milk obtained is concerned. The observations began on 1st of November, 1884, and were continued until the 18th of April, 1885; extending thus over a term of nearly six months.

Two cows—Lady Horace (grade Ayrshire), and Bessie (grade Jersey),—both from seven to eight years old, and of a corresponding milking period, served for the trial. The last calf had been dropped between the 16th and 18th of October, 1884.

Hay, corn fodder, corn ensilage, corn meal, wheat bran and gluten meal constituted the ingredients for the compounding of the daily diet; they were fed periodically, in varying proportions and in different combinations, to notice their comparative individual merits, if any should become conspicuous. The same weights of corn meal, gluten meal and wheat bran, whenever used, were retained throughout the entire experiments; whilst the weight of the hay, corn fodder and corn ensilage was altered in consequence of being fed either alone or in some particular combination with each other. The entire amount of these articles consumed under both conditions was limited in every instance by the inclination of the animal. The first feeding took place between six and seven o'clock in the morning, the second at noon, and the third at six o'clock in the evening. Corn meal, wheat bran and gluten meal were usually fed, together with a small amount of the coarser feed, during milking, morning and evenings, whilst the remainder of the coarser feed was offered subsequently three times during the day. The amount left over was weighed and deducted from the previous record. The price which has been adopted in our subsequent valuation of each article of fodder used during the experiments, is based on our local condition of the market, and does not directly apply to more favored localities. The cost of one quart of milk, as stated below, may vary thus in case of the same kind and the same amount of feed and of a corresponding yield of milk, from that in other localities, Whilst our statements of cost of feed for the production of one quart of milk can only claim a direct application for a limited locality, it will be conceded that the statement of relative cost of the milk in case of different combinations of fodder articles for its production, may fairly claim a more general consideration. The following rates of prices have been adopted in our subsequent valuation, per ton of 2000 pounds: Corn meal and wheat bran, $23.00; gluten meal, $22.50; hay, $15.00; dry corn fodder, $5.00; corn ensilage, $2.75. The price of the latter is based on the following circumstances: well dried corn fodder contains 20 per cent. of moisture and 80 per cent. of dry vegetable matter; green corn fodder adapted to the production of ensilage, contains from 18 to 22 per cent of vegetable matter and 82 to 78 per cent. of moisture. Four tons of such green fodder corn will produce one ton of dry corn fodder, as described. Counting one ton of green corn fodder worth $1.25, and the cost of converting it into ensilage equal to $1.50—a rather liberal allowance—one ton of corn ensilage would be worth $2.75. As the relative nutritive value of a fodder article—in case of the same kind and condition of the animal—depends, aside from its general adaption, on its actual percentage of dry vegetable matter, and on the particular relative proportion of its nitrogenous (protein) and non-nitrogenous constituents, the total amount of dry vegetable matter contained in the entire daily diet during each feeding period has been stated, alongside of the daily yield of milk. The relative proportion of digestible nitrogenous and non-nitrogenous constituents of the feed is expressed by "Nutritive Ratio"—taking Nitrogen=1. This mode of reporting our observations has been adopted for the purpose of assisting the reader in the recognition of the amount of dry vegetable matter consumed daily by each cow during each period of feeding; and of rendering more conspicuous the effect of each particular combination of fodder articles on the daily yield of milk, as well as the general condition of the animals on trial.

The weights of the latter were ascertained once each week before milking and feeding in the morning. Lady Horace weighs at present 950 pounds, and Bessie 822 pounds, which is approximately the same as at the beginning of the experiments. The former yields at present from 23 to 24 pounds of milk per day, and the latter from 21 to 22 pounds, with a daily diet consisting of the same amount of hay, corn meal and wheat bran, which constituted the daily feed during the first feeding period (Nov. 1—10). The decline of milk production (independent of kind and amount of feed), in consequence of the progress of the milking period (since Nov. 1st), amounts apparently to nine pounds per day in the case of both cows. The results obtained confirm in several directions those reported in previous bulletins (see Nos. 10–11–12). They show the good services of wheat bran and gluten meal as constituents of the daily diet of milch cows, and also the favorable influence of good corn ensilage on the flow of milk—comparing pound for pound of dry vegetable matter fed, with the yield of milk; yet it is not less apparent that a too exclusive feeding of corn ensilage affects seriously the general condition of the animal. No serious alteration in the composition of the milk obtained under such conditions has thus far been noticed; our samples of milk compared well with the best we have tested from other feed.

I. RECORD OF LADY HORACE.

FEEDING PERIODS.	Feed consumed (lbs.) per day.						Milk produced (lbs.) per day.			Amt. of dry vegetable matter contained in the daily fodder consumed in pounds.	Nutritive Ratio.	Weight of Animal.
	Wheat shorts.	Corn Meal.	Gluten Meal.	Hay.	Corn fodder.	Corn Ensilage cut.	Morning.	Evening.	Total.			
Nov. 1–10,	3.25	3.25		20.			19.3	15.7	35.0	23.63	1:8.11	930
" 11–17,	3.25	3.25		20.			17.1	14.0	31.1	23.63		900
" 18–24,	3.25	3.25		17.4			15.4	13.5	28.9	21.30	1:7.99	905
" 25–Dc. 1,	3.25	3.25		18.9			17.2	13.4	30.6	22.65		985
Dec. 4–13,	3.25	3.25	3.25	19 0			18.1	14.4	32.5	25.61	1:6.53	992
" 14–23,	3.25	3.25	3.25	8.3	8.3		17.2	12.4	29.6	23.75	1:5.79	944
" 24–Jn. 2,	3.25	3.25		10.1	10.1		15.4	10.9	26.3	24.17	1:7.01	1015
Jan. 3–12,	3.25	3.25		10.3	10.3		14.2	10.0	24.2	24.53		996
" 13–22,	3.25	3.25		10.7	10.7		13.9	10.2	24.1	25.27		1004
" 27–Fb.3,	3.25	3.25		4.0		30.6	14.5	9.9	24.4	14.86	1:7.47	952
Feb. 4–10,	3.25	3.25				39.1	13.4	9.9	23.3	12.82	1:7.26	905
" 16–22,	3.25					55.0	11.6	7.7	19.3	12.85	1:7.0	895
" 23–Mr.1,	3.25					49.0*	11.3	8.6	19.9	11.12		855
Mar. 2–8,	3.25					46.6	11.0	8.1	19.1	10.72		876
" 13–19,		3.25				36.6	12.0	9.1	21.1	9.02	1:8.7	893
" 24–30,		3.25		20.0			11.1	7.9	19.0	20.75	1:9.75	892
" 31–Ap.6,	3.25			20.0			10.9	7.7	18.6	20.77	1:8.28	935
Apr. 12–18,	3.25	3.25		20.0			12.4	9.7	22.1	23.63	1:8.11	897

*Commenced feeding ensilage of uncut corn Feb. 23.

ANALYSES OF MILK.

	November.		*December.*				*January.*		
	18	*24*	*5*	*10*	*17*	*23*	*7*	*15*	*21*
Water,	86.02	87.15	85.12	87.20	87.26	86.22	87.41	87.05	86.54
Solids,	13.98	12.85	14.88	12.80	12.74	13.78	12.59	12.95	13.46
Fat (in solids,)	4.98	3.65	5.10	3.74	3.86	4.70	3.64	3.95	3.97
Solids not fat,	9.00	9.20	9.78	9.06	8.88	9.08	8.95	9.00	9.49

	February.		*March.*			*April.*	
	3	*10*	*5*	*16*	*30*	*6*	*13*
Water - - - - -	86.28	86.95	86.52	85.20	86.36	87.53	86.25
Solids, - - - - -	13.72	13.05	13.48	14.08	13.64	12.47	13.75
Fat, (in solids,) - -	4 53	3.30	4.90	3.66	4.51	3.58	4.51
Solids not fat, - -	9.19	9.75	8.58	10.42	9.13	8.89	9.24

II. RECORD OF BESSIE.

FEEDING PERIODS.	*Feed consumed (lbs.) per day.						Milk produced (lbs.) per day.			Amt. of dry vegetable matter contained in the daily fodder consumed in pounds.	*Nutritive Ratio.	Weight of Animal.
	Wheat shorts.	Corn Meal.	Gluten Meal.	Hay.	Corn fodder.	Corn Ensilage cut.	Morning.	Evening.	Total.			
Nov. 1–10,	3.25	3.25		19.6			17.4	14.4	31.8	23.27	1:8.1	810
" 11–17,	3.25	3.25		20.0			16.1	12.9	29.0	23.63		805
" 18–24,	3.25	3.25		15.0			14.3	11.6	25.9	19.16	1:7.76	786
" 25–Dc.1,	3.25	3.25		15.6			14.9	10.0	24.9	19.69		790
Dec. 4–13,	3.25	3.25	3.25	14.6			16.0	12.7	28.7	21.22	1:6.10	817
" 14–23,	3.25	3.25	3.25	7.4	7.3		15.4	11.9	27.3	22.02	1:5.68	828
" 24–Jn. 2,	3.25	3.25		7.7	7.7		14.8	10.5	25.3	19.80	1:6.84	855
Jan. 3–12,	3.25	3.25		8.5	8.4		14.3	10.0	24.3	21.15		866
" 13–22,	3.25	3.25		8.0	8.0		13.8	9.1	22.9	20.34		867
" 27–Fb.3,	3.25	3.25		4.0		36.3	13.7	9.1	22.8	15.90	1:7.64	821
Feb. 4–10,	3.25	3.25				39.0	13.0	9.0	22.0	12.81	1:7.26	792
" 16–22,	3.25					54 3	11.7	7.0	18.7	12.72	1:6.92	775
" 23–Mr.1,	3.25					50.0*	10.4	7.0	17.4	11.29		790
Mar. 2–8,	3.35					40.0	9.1	7.0	16.1	9.61		755
" 13–19,		3.25				34.3	8.3	7.0	15.3	8.63	1:8.67	730
" 24–30,		3.25		16.3			9.0	7.1	16.1	17.44	1:9.62	750
" 31–Ap.6,	3.25			14.6			9.1	7.0	16.0	15.94	1:7.78	782
Apr. 12–18,	3.25	3.25		16.0			11.6	9.3	20.9	20.05	1:7.81	782

*Commenced feeding ensilage of uncut corn Feb. 23.

ANALYSES OF MILK.

	November.		*December.*				*January.*		
	17	***24***	***5***	***10***	***17***	***23***	***7***	***15***	***21***
Water,	87.00	86.91	86.18	86.99	87.41	85.36	87.26	87.29	87.89
Solids,	13.00	13.09	13.82	13.01	12.59	14.64	12.74	12.71	12.11
Fat (in solids,)	4.04	3.86	4.02	3.72	3.32	4.75	3.73	3.91	3.02
Solids not fat,	8.96	9.23	9.80	9.29	9.27	9.89	9.01	8.80	9.09

	February.		*March.*			*April.*	
	2	***10***	***5***	***16***	***30***	***2***	***13***
Water,	86.92	86.54	85.53	87.19	87.15	86.81	87.35
Solids,	13.08	13.46	14.47	12.81	12.85	13.19	12.65
Fat (in solids,)	4.90	4.11	4.74	3.86	3.54	4.49	3.74
Solids not fat,	8.18	9.35	9.73	8.95	9.31	8.70	8.91

COST OF FEED PER QUART OF MILK.

(LADY HORACE.)

FEEDING PERIODS.	Total quantity of milk in period.	Average daily milk for period.	Total amount of shorts consumed for period.	Total amount of corn meal consumed for period.	Total amount of hay consumed for period.	Total amount of dry corn fodder consumed for period.	Total amount of ensilage consumed for period.	Total amount of gluten meal consumed for period.	Total cost of fodder for period.	Av. cost of feed for the production of qt. of milk for period.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	$	ct.
Nov. 1–10,	350.0	35.0	32.5	32.50	200.0				2.25	1.29
" 11–17,	217.7	31.1	22.75	22.75	140.0				1.57	1.44
" 18–24,	203.3	28.9	22.75	22.75	121 8				1.44	1.42
" 25–Dec. 1,	214.2	30.6	22.75	22.75	132.3				1.52	1.42
Dec. 4–13,	325.0	32.5	32.50	32.50	190.0			32.50	2.54	1.56
" 14–23,	296.0	29.6	32.50	32.50	83.0	83.0		32.50	1.95	1.32
" 24–Jan. 2,	263.0	26.3	32.50	32.50	101.0	101.0			1.76	1.34
Jan. 3–12,	242.0	24.2	32.50	32.50	103.0	103.0			1.78	1.47
" 13–22,	241.0	24.1	33.50	32.50	107.0	107.0			1.82	1 51
" 27–Feb. 3,	195 2	24.4	26.00	26.00	32 0		244.8		1.18	1.21
Feb. 4–10,	163.1	23.3	22.75	22.75			273.7		.90	1.11
" 16–22,	135.1	19.3	22.75				385.0		.79	1.17
" 23–Mar. 1,	139.3	19.9	22.75				343 0		.73	1.05
Mar. 2–8,	133.7	19.1	22.75				326.2		.71	1.06
" 13–19,	147.7	21.1		22.75			256.2		.61	0.83
" 24–30,	133.0	19.0		22.75	140.0				1.31	1.97
" 31–Apr. 6,	130.2	18.6	22.75		140.0				1.31	2.01
Apr. 12–18,	154.7	22.1	22.75	22.75	140.0				1.57	2.03

COST OF FEED PER QUART OF MILK.

(BESSIE.)

FEEDING PERIODS.	Total quantity of milk produced during the entire period.	Average daily yield of milk for period.	Total amount of shorts consumed for period.	Total amount of corn meal consumed for period.	Total amount of hay consumed for period.	Total amount of dry corn fodder consumed for period.	Total amount of ensilage consumed for period.	Total amonnt of gluten meal consnmed for period.	Total cost of fodder for period.	Av. cost of feed for the production of qt. of milk for period.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	$	ct.
Nov. 1–10, - -	318.0	31.8	32.50	32.50	196.0				2.22	1.39
" 11–17, - -	203.0	29.0	22.75	22.75	140.0				1.57	1.55
" 18–24, - -	168.0	24.0	22.75	22.75	105.0				1.31	1.56
" 25–Dec. 1, - -	181.3	25.9	22.75	22.75	109.2				1.34	1.48
Dec. 4–13, - -	287.0	28.7	32.50	32.50	146.0			32.50	2.21	1.55
" 14–23, - -	273.0	27.3	32.50	32.50	74.0	73.0		32.50	1.85	1.36
" 24–Jan. 2, - -	253.0	25.3	32.50	32.50	77.0	77.0			1.52	1.20
Jan. 3–12, - -	243.0	24.3	32.50	32.50	85.0	84.0			1.60	1.32
" 13–22, - -	229.0	22.9	32.50	32.50	80.0	80.0			1.55	1.35
" 27–Feb. 3, - -	182.4	22.8	26.00	26.00	32.0		290.4		1.24	1.36
Feb. 4–10, - -	154.0	22.0	22.75	22.75			273.0		.90	1.17
" 16–22, - -	130.9	18.7	22.75				380.1		.79	1.21
" 23–Mar. 1, - -	121.8	17.4	22.75				350.0		.74	1.22
Mar. 2–8, - -	112.7	16.1	22.75				280.0		.65	1.16
" 13–16, - -	107.1	15.3		22.75			240.1		.59	1.10
" 24–30, - -	112.7	16.1		22.75	114.1				1.12	1.99
" 31–Apr. 6, - -	112.0	16.0	22.75		102.2				1.03	1.84
Apr. 12–18, - -	146.3	20.9	22.75	22.75	112.0				1.36	1.86

SPECIAL ANALYSES OF MILK.

Regarding the quantity and quality of nitrogenous constituents of samples of milk collected before, during and after feeding corn ensilage.

LADY HORACE.

	Jan. 21.		*Feb. 10.*		*March 5.*	
Specific gravity,	**1.0346 at 18° C.**		**1.0341 at 13° C.**		**1.032 at 13° C.**	
Solids,	**13.46**	**per cent.**	**13.05**	**per cent.**	**13.48**	**per cent.**
Fat (in solids)	**3.97**	"	**3.30**	"	**4.90**	"
Solids not fat,	**9.49**	"	**9.75**	"	**8.58**	"
Ash,	**0.80**	"	——	"	**0.80**	"
Nitrogen in casein,	**0.43**	"	**0.29**	"	**0.31**	"
" " albumin,	**0.04**	"	**0.06**	"	**0.04**	"
" " lacto-protein,*	**0.05**	"	**0.11**	"	**0.06**	"
Total nitrogen,	**0.52**	"	**0.46**	"	**0.41**	"

BESSIE.

	Jan. 21.		*Feb. 10.*		*March 5.*	
Specific gravity,	1.0338 at 16° C.		1.0338 at 16° C.		1.035 at 1.45°C.	
Solids,	12.12	per cent.	13.49	per cent.	14.47	per cent.
Fat (in solids)	3.02	"	3.72	"	4.74	"
Solids not fat,	9.10	"	9.77	"	9.73	"
Ash,	0.76	"	——	"	0.68	"
Nitrogen in casein,	0.40	"	0.30	"	0.43	"
" " albumin,	0.05	"	0.05	"	0.04	"
" " lacto-protein,*	0.06	"	0.10	"	0.07	"
Total nitrogen,	0.51	"	0.45	"	0.54	"

The results of these analyses are within the variations noticed in milk of recognized good quality.

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* Collective name for nitrogenous constituents not casein or albumin.

ANALYSES OF FODDER ARTICLES.

263. ENSILAGE OF CUT CORN.

From corn raised upon plats of the Experiment Station.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	81.88	1637.60			
Dry Matter,	18.12	362.40			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	5.07	101.40	377.71	72	1:11.8
" Cellulose,	26.23	524.60	52.35	75	
" Fat,	3.49	69.80	114.32	73	
" Protein, (nitrogenous matter),	7.83	156.60	768.89	67	
Non-nitrogenous extract matter,	57.38	1147.60			
	100.00	2000.00	1313.27		

The filling of the silo was carried on during the first and second day of September, 1884; the mass was covered over with boards without weights until the temperature in the mass ceased to increase. In a few places, about eighteen inches below the surface of the mass, the temperature rose to 122° F. or 50° C.; whilst taking the entire silo into consideration, 116° F. or 47° C., represents fairly the highest average temperature attained in our case. The mass showed a slight acid reaction of the second day after cutting the corn, and before putting on the final weight (60 pounds of sand per square foot, in barrels, as in the preceding year). The silo was opened for the use of its contents on the 20th of January, '85. The ensilage was found covered with a mouldy mass several inches in thickness. This being removed, the remainder proved—although acid to customary reagents—a fair article of its kind, and a decided improvement on the ensilage of the first trial. This result is largely due to the fact of using the corn of a more mature stage of growth. For the details of the production of the ensilage, I have to refer to the report of the Secretary of the State Board of Agriculture for 1884.

264. WHOLE CORN ENSILAGE.

From corn raised upon plats of Experiment Station.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	83.18	1663.60			
Dry Matter,	16.82	336.40			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	4.23	84.60			1 : 9.71
" Cellulose,	29.44	588.80	423.84	72	
" Fat,	3.69	73.80	55.35	75	
" Protein, (nitrogenous matter),	9.03	180.60	131.84	73	
Non-nitrogenous extract matter,	53.61	1072.20	718.37	67	
	100.00	2000.00	1329.40		

The silo was filled with whole corn, and covered at once, September 1, 1885, as described in detail in the last annual report of the Station; it was opened for feeding purposes on 23d of February, 1885. The odor of fresh ensilage resembled that of the pineapple (Propionic ether), and turned within twenty-four hours of exposure to the air, into that of vinegar; it had a slight acid reaction when first exposed, The color was yellowish green, indicating a good state of preservation; the interior parts of the uncrushed stems showed the presence of saccharine constituents (glucose); and the kernels in the ear contained still an abundance of starch. The ensilage obtained from whole corn plants—at once closed up—was in a better state of preservation than that which had been obtained from the same quality of corn previously cut into pieces of from 1¼ to 1½ inches in length, and treated for the production of ensilage as described in the previous statement. The mechanical condition of the whole corn ensilage is less satisfactory for feeding purposes, as far as an economical consumption of the same weight of both are concerned, than that produced from corn previously cut into pieces of from one and one-quarter to one and one-half inch in length.

265. SHREDDED CORN FODDER.

From experimental plats of the Station.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	6.95	139.00			
Dry Matter, ...	93.05	1861.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	5.16	103.20			1 : 7.23
" Cellulose, ...	33.46	669.20	481.82	72	
" Fat, ...	1.71	34.20	25.65	75	
" Protein, (nitrogenous matter),	12.15	243.00	163.39	73	
Non-nitrogenous extract matter, . .	47.52	950.40	636.77	67	
	100.00	2000.00	1307.63		

The corn was cut September 1st, 1885, when the kernels were in the milk. The green fodder contained 21.9 per cent. of dry vegetable matter, and had the appearance of a somewhat prematurely ripened crop, a circumstance confirmed by the results of the analysis, which shows a smaller amount of saccharine and starchy constituents than commonly noticed in this variety of corn ("Clark") at the stated stage of growth.

FERTILIZER ANALYSES.

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266. Bradley's Original Coe. Collected of D. J. Wright, Northampton, Mass.

Guaranteed composition: total phosphoric acid, 11 to 14 per cent.; soluble phosphoric acid, 7 to 8 per cent.; reverted phosphoric acid. 2 to 3 per cent.; insoluble phosphoric acid, 2 to 3 per cent.; nitrogen, 2.05 to 2.85 per cent. (equivalent to ammonia 2.5 to 3.5 per cent.)

267. Quinnipiac Co.'s (Cross-brand) Fish and Potash. Collected of D. A. Horton, Northampton, Mass.

Guaranteed composition; nitrogen, 3¼ to 4¼ per cent.; total phosphoric acid, 5 to 7 per cent.; soluble and reverted phosphoric acid, 3 to 5 per cent.; potassium oxide, 3 to 5 per cent.

268. Bowker's Hill and Drill Phosphate. Collected of J. and J. A. Rice, Worcester, Mass.

Guaranteed composition; nitrogen, 2½ to 3¼ per cent., (equivalent to ammonia, 3 to 4 per cent.); total phosphoric acid, 11 to 13 per cent.; soluble phosphoric acid, 8 to 10 per cent.; reverted phosphoric acid, 1 to 2 per cent.; potassium sulphate, 2 to 3 per cent.

269. Mitchell's Standard Superphosphate. Collected of J. and J. A. Rice, Worcester, Mass.

Guaranted composition; ammonia 2 to 3 per cent., (equivalent to nitrogen, 1.6 to 2.47 per cent.); soluble phosphoric acid, 8 to 10 per cent.; insoluble phosphoric acid. 3 to 4 per cent.

	266	*267*	*268*	*269*
		Pounds per hundred.		
Moisture at 100° C.,	12.95	26.45	16.28	15.53
Total phosphoric acid,	12.54	4.98	12.34	10.98
Soluble " "	8.23	1.73	7.90	6 33
Reverted " "	1.90	2.93	2.63	3.30
Insoluble " "	2.41	.32	1.81	1.35
Nitrogen,	3.07	3.63	2.77	1.43
Potassium oxide,	0.30	3.28	1.41	3.84
Insoluble matter,	6.08			6.10
Valuation per 2000 lbs.	$31.09	$23.92	$31.89	$25.96

270. L. L. Crocker's Ammoniated Bone Superphosphate. Collected of Chas. W. Sears, Worcester, Mass.

Guaranteed composition: soluble phosphoric acid, 6 to 8 per cent.; reverted phosphoric acid, 2 to 4 per cent.; insoluble phosphoric acid, 1 to 2 per cent.; ammonia, 3½ to 4½ per cent. (equivalent to nitrogen 2.9 to 3.7 per cent.); potassium oxide, 1 to 3 per cent.

271. Quinnipiac Co. Dry Ground Fish. Collected of D. A. Horton, Northampton, Mass.

Guaranteed composition: nitrogen, 7 to 10 per cent.; soluble and reverted phosphoric acid, 4 to 6 per cent.; total phosphoric acid, 6 to 8 per cent.

272. Quinnipiac Co. Phosphate. Collected of D. A. Horton, Northampton, Mass.

Guaranteed composition: nitrogen, 2½ to 3½ per cent.; soluble and reverted phosphoric acid, 8 to 10 per cent.; insoluble phosphoric acid, 1 to 3 per cent.; potassium oxide, 2 to 3 per cent.

273. Fertilizer sent on for examination by farmers' club near Worcester, Mass.

	270	*271*	*272*	*273*
		Pounds per hundred.		
Moisture at 100° C.,	11.55	8.20	17.60	7.15
Total phosphoric acid,	10.37	7.14	12.13	14.00
Soluble " "	6.30	.67	8.06	11.26
Reverted " "	2.55	2.70	2.18	2.38
Insoluble " "	1.52	3.77	1.89	.36
Potassium oxide,	1.42	——	2.07	1.13
Nitrogen,	3.37	7.96	3.16	2.56
Insoluble matter,	——	3.50	4.23	.83
Valuation per 2000 pounds,	$29.98	$37.21	$32.65	$34.55

274. Bradley's X L Ammoniated Bone Superphosphate. Collected of J. & J. A. Rice, Worcester, Mass.

Guaranteed composition: nitrogen, 2½ to 3¼ per cent; (ammonia, 3 to 4); soluble phosphoric acid, 7 to 8 per cent.; reverted phosphoric acid, 2 to 3 per cent. insoluble phosphoric acid, 2 to 3 per cent.; total phosphoric acid, 11 to 14 per cent.; potassium oxide, 2 to 3 per cent.

275. Bosworth Brothers' Superphosphate of Lime. Collected of Wilson & Holden, Worcester, Mass.

Guaranteed composition: nitrogen, 2 to 2½ per cent.; soluble phosphoric acid, 7 to 8 per cent.; reverted phosphoric acid, 4 to 5 per cent.; insoluble phosphoric acid, 2 to 3 per cent.; potassium oxide, 2 to 3 per cent.

276. Mapes' Complete Manure. Collected of W. H. Earle & Co., Worcester, Mass.

Guaranteed composition: ammonia, 6 to 7 per cent. (equivalent to nitrogen 5 to 5.76 per cent.); phosphoric acid, 10 to 12 per cent.; potassium oxide, 3 to 4 per cent.

277. Williams, Clark & Co.'s Ammoniated Bone Superphosphate. Collected of B. L. Bragg & Co., Springfield, Mass.

Guaranteed composition: ammonia, 2 to 3 per cent. (equivalent to nitrogen 1.6 to 2.47 per cent.); total phosphoric acid, 10 to 13 per cent.; soluble phosphoric acid, 6 8 per cent.; reverted phosphoric acid, 3 to 4 per cent.: insoluble phosphoric acid, 1 to 3 per cent.; potassium sulphate, 4 to 6 per cent. (equivalent to potassium oxide, 2 to 3 per cent.); magnesium sulphate, 3 to 4 per cent.

	274	*275*	*276*	*277*
		Pounds per hundred.		
Moisture at 100° C..	12.30	10.48	16.00	13.03
Total phosphoric acid,	13.12	15.86	14.40	12.73
Soluble " "	7.80	4.54	1.63	9.76
Reverted " "	2.12	5.38	7.89	1.[illegible]6
Insoluble " "	3.20	5.91	4.88	1.01
Nitrogen,	3.23	2.13	4.58	3.04
Potassium oxide,	1.76	2.45	3.54	2.51
Insoluble matter,	5.28	1.33	1.20	1.20
Valuation per 2000 pounds,	$33.12	$31.28	$38.85	$35.94

C. A. GOESSMAN, *Director*,

AMHERST, MASS.

The Bulletin of the Experiment Station will be sent free of charge to all parties interested in its work, on application. Applications for Annual Reports will receive attention as soon as extra copies are received for distribution.

J. E. Williams, Printer, Amherst, Mass.

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BULLETIN No. 16.

JULY, 1885.

Meteorological Summary for two months ending June 30th.

	MAY.	JUNE.
Highest temperature,	85.0°	89.0°
Lowest temperature,	21.0°	35.0°
Mean temperature,	54.8°	63.8°
Mean Relative Humidity,	73.0 per ct.	76.2 per ct.
Total rainfall,	3.08 in.	3.49 in.
Prevailing winds,	Westerly.	Southwesterly.
No. of days on which 0.01 inch of rain fell,	6	8
No. of days on which cloudiness averaged 8 or more on scale of 10,	11	5
Dates of frosts,	10th, 11th, 12th.	10th.

The surface of the ground was frozen and ice had formed on the morning of May 4. The frosts of May 10th, 11th, and 12th were moderately severe; that of June 10th was very light, confined to low lands, and did no damage in this locality.

The rainfall has been abundant and favorably distributed.

FODDER ANALYSES.

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278. BLUE JOINT GRASS-HAY.

(CALAMAGROSTIS CANADENSIS.)

From the lands along Ipswich River; for the Essex County Agricultural Society.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	5.90	118.00			
Dry Matter, ...	94.10	1882.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	6.20	124.00			1 : 13.08
" Cellulose, ...	28.91	578.20	335.36	58	
" Fat, ...	2.54	50.80	23.37	46	
" Protein, (nitrogenous matter),	7.29	145.80	83.11	57	
Non-nitrogenous extract matter, . .	55.06	1101.20	693.76	63	
	100.00	2000.00	1135.60		

The grass had been cut in the first week in August. The hay sent on consisted, in the main, of Blue Joint grass ; yet contained, besides, a variety of other plants found in similar localities, as Juncus, Cyperus, etc. Its composition is similar to that of several samples of hay obtained from low marsh meadows, sent on by the Rowley Farmers' Club (see I Annual Report, 1883, pages 74 and 75).

279. HOMINY MEAL.

(Sent on for examination from Bolton, Mass.) 70.56 per cent. passed through screen, with mesh 144 to sq. inch.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	8.11	162.20			
Dry Matter, ...	91.89	1837.80			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	3.24	64.80			1 : 9.28
" Cellulose, ...	4.78	95.60	32.50	34	
" Fat, ...	12.22	244.40	185.74	76	
" Protein, (nitrogenous matter),	11.76	235.20	199.92	85	
Non-nitrogenous extract matter, . .	68.00	1360.00	1278.40	94	
	100.00	2000.00	1696.56		

The article was of a good mechanical condition ; and its composition notable on account of the exceptional high percentage of fat. The statement concerning its digestibility is based on that of the corn,—as no actual trials in that direction are known to us.

ANALYSES OF GARDEN CROPS.

280. HORSE-RADISH.

COCHLEARIA ARMORACIA L. ; MUSTARD FAMILY, (CRUCIFERÆ).

The examination of this well-known garden plant was carried on at the request of a farmer in Franklin county, who is engaged in the preparation of horse-radish "with vinegar," for family use. The roots had evidently lost some of their original moisture by storing, at the time of their examination.

One hundred parts of the fresh roots contained:

Moisture at 100° C.,	76.68	per cent.
Dry matter,	23.32	"
Nitrogen in dry matter,	0.36	"
Sulphur in dry matter,	0.06	"
Crude ash in dry matter,	1.87	"

The crude ash—1.87—consisted of 0.71 parts of insoluble silicious matter (including, most likely, some soil), and of 1.16 parts of soluble mineral constituents of plant food.

Relative proportion of essential ash constituents, soluble in acids, sulphur and chlorine excluded:

Magnesium oxide,	8.24	per cent.
Ferric oxide,	2.13	"
Calcium oxide,	13.47	"
Sodium oxide,	10.29	"
Potassium oxide,	62.06	"
Phosphoric acid,	3.81	"
	100.00	

The roots contain, besides a notable amount of nitrogenous constituents, a series of valuable non-nitrogenous substances, as starch, sugar, gum, and organic acids,—a circumstance which cannot fail to impart to them a considerable nutritive value, equal, if not superior, to several of our most valued root-crops. Their peculiarity consists, mainly, in the presence of some sulphur-containing organic constituents (myrosin, etc.), which cause, in the fresh and crushed roots, the production of a sulphur-containing, volatile compound. The latter resembles, in odor and taste, the volatile mustard oil (Rhodanallyl). Some investigators assume their identity. The amount of this product, according to the statement of good observers, depends largely either on the general character of the soil, or on the presence of some peculiar constituent in the latter.

It would be not without interest to study the effect of gypsum, or of sulphate of potash, as a special fertilizer, on the character of the roots raised in their presence.

281. RHUBARB.

	Stems and Leaves, Fresh.	Roots, Fresh.
Moisture,	91.67 per cent.	74.35 per cent.
Dry Matter,	8.33 “	25.65 “
Nitrogen (in dry matter),	0.13 “	0.55 “
Crude Ash (in dry matter),	1.72 “	2.28 “
Insoluble Matter in Ash,	0.22 “	0.25 “
Potassium oxide,	0.36 “	0.53 “
Sodium oxide,	0.03 “	not determined.
Calcium oxide,	0.34 “	0.50 “
Magnesium oxide,	0.13 “	0.16 “
Phosphoric acid,	0.02 “	0.06 “
Ferric oxide,	0.003 “	0.02 “

Relative proportion of the essential ash constituents, soluble in acids:

Potassium oxide,	41.37 per cent.	37.92 per cent.
Sodium oxide,	3.39 “	8.84 “
Calcium oxide,	38.62 “	35.95 “
Magnesium oxide,	14.50 “	11.40 “
Phosphoric acid,	1.80 “	4.32 “
Ferric oxide,	0.32 “	1.57 “

The analysis has been carried out at the request of garden farmers in the eastern part of the State. The sample was collected from the fields of the College, at the time when the plant was blooming. The results may give some more definite basis for an advantageous mode of manuring.

FERTILIZER ANALYSES.

282. WOOD ASHES.

I, II. Ashes sent on from Beverley, Mass.

III. Canada ashes, sent on by the secretary of the Greenfield Farmers' Club.

IV. Sent on for examination from Chicopee, Mass.

	I	II	III	IV
Moisture at 100° C.,	8.80	14.40	12.93	15.73
Potassium oxide,	2.18	2.25	5.50	5.93
Calcium oxide,	45.90	34.33	33.99	35.45
Magnesium oxide,	3.63	3.13	4.22	3.41
Phosphoric acid,	2.22	1.79	2.05	1.60
Insoluble matter,	8.86	14.40	10.42	10.29

Samples I and II are, apparently, partly leached; samples III and IV are of a fair average composition.

283. POTASH SALTS.

Sent by the secretary of the Dartmouth Farmers' Club.

I. Potash Salts; a fused, hard mass, of a grayish-white color.
II. Black or Blue Ash; a moist, lumpy mass, easily pulverized.

	I	II
	Pounds per hundred.	
Moisture at 100° C.,	1.08	14.60
Potassium oxide,	42.06	13.13
Sodium oxide,	24.51	4.51
Chlorine,	19.30	0.08
Sulphuric Acid,	1.38	7.90
Insoluble matter,	1.00	3.30

These articles are evidently waste materials from some potash industry. No. I represents a value of from $36 to $37 per ton; it contains some potassium sulphide, and ought to be exposed to the air, previous to its application, to prevent injurious influences on the young growth. No. II contains a considerable amount of carbonates, and is better fitted for direct use as a potash source; it is worth from $11 to $12 per ton.

284. KRUGIT.

Bowker Fertilizer Co., Boston, Mass.

	Per Cent.
Moisture at 100° C.,	4.82
Sodium oxide,	5.57
Potassium oxide,	8.42
Calcium oxide,	12.45
Magnesium oxide,	8.79
Sulphuric acid,	31.94
Hydrochloric acid,	6.63
Insoluble matter (in acids),	14.96

This saline belongs to the products of the "German Potash Industry" at Strassfurt. It contains from 15 to 16 per cent. of sulphate of potassa, besides sulphate of lime (gypsum), sulphate of magnesia, and chloride of sodium (common salt), etc. A careful trial of the article upon hill pastures as a top-dressing, in connection with fine-ground bones, deserves attention. It sold at $14 per ton of 2,000 lbs., on board of car, Boston.

285. **I.** Double Sulphate of Potash and Magnesia, sent on for examination.

II. Double Sulphate of Potash and Magnesia, sent on from Hatfield, Mass.

	I	*II*
	Pounds per hundred.	
Moisture at 100° C.,	1.95	2.73
Potassium oxide,	23.37	18.92
Magnesium oxide,	12.86	13.08
Calcium oxide,	3.38	3.97
Sodium oxide,	not determined	9.61
Sulphuric acid,	45.52	41.89
Chlorine,	1.36	7.80
Insoluble matter,	2.10	2.36

The samples represent, probably, the extremes in composition. Large percentages of chlorides are, in many instances, considered objectionable, in high-priced sulphates. The articles have been offered at from $38 to $40 per ton.

286. BONEBLACK WASTE.

I. Sent on by Bolton Farmers' and Mechanics' Association, Bolton, Mass.

II. Sent on for examination, from Concord, Mass.

	I	*II*
	Pounds per hundred.	
Moisture at 100° C.,	2.30	6.00
Total phosphoric acid,	30.20	27.36
Insoluble matter,	1.53	6.60

Allowing four cents per pound of phosphoric acid, for boneblack of a fine mechanical condition, Sample I represents a value of from $23 to $24; and Sample II, of from $21 to $22, per ton of 2,000 lbs. The valuation of these articles depends, somewhat, on their mechanical condition. They furnish a superior material for the manufacture of superphosphate of lime.

287. FISH WASTE.

Sent on by secretary of Hampshire, Franklin, and Hampden Society.

	Per Cent.
Moisture at 100° C.,	41.92
Total phosphoric acid,	5.20
Soluble " "	0.83
Reverted " "	2.02
Insoluble " "	2.35
Nitrogen,	7.60
Insoluble matter,	.28

Valuation, per 2,000 lbs.: $34.37.

288. AMMONITE.

Sent on by secretary of Hatfield Grange.

Guaranteed composition: ammonia, 15 to 16 per cent. (equivalent to nitrogen 12.4 to 13.2 per cent.); phosphoric acid, 4 to 6 per cent.

	Per Cent.
Moisture at 100° C.,	5.88
Total phosphoric acid,	3.43
Nitrogen (= ammonia 13.76 per cent. —),	11.33
Insoluble matter,	1.38

Valuation, per 2,000 lbs.: $44.90.

The article consists, evidently, of fine-ground animal matter, freed from fat. Its general physical character is apparently favorable to a speedy disintegration. The material deserves attention as a source of nitrogen for plant growth.

289. ASH OF SPENT TAN BARK.

Sent on for examination, from North Adams, Mass.

	I	*II*
	Per Cent.	
Moisture at 100° C.,	7.75	
Calcium oxide,	31.78	31.35
Magnesium oxide,	2.57	5.10
Potassium oxide,	1.14	2.87
Phosphoric acid,	2.77	1.92

The article resembles leached wood-ash, as might be expected from the previous treatment of the hemlock bark.

290. HOME-MADE SUPERPHOSPHATE.

Sent on for examination, from Marblehead, Mass.

	Per Cent.
Moisture at 100° C.,	26.03
Total phosphoric acid,	12.78
Soluble " "	10.87
Reverted " "	0.59
Insoluble " "	1.32
Insoluble matter,	16.04

Valuation, per ton of 2,000 lbs.: $21.04.

The article was obtained, according to a communication received, by treating one thousand pounds of fine-ground South Carolina rock phosphate with six hundred pounds of sulphuric acid of 66° B., specific gravity, diluted previously with an equal volume of water. As the mixture thus produced remains, for some time, more moist than desirable, it is recommended to use equal *weights* of *acid* and *water*.

291. FINE GROUND BONES.

Sent on for examination, from Hingham, Mass.

	I	*II*
	Pounds per hundred.	
Moisture at 100° C.,	4.05	3.65
Total phosphoric acid,	23.77	26.37
Reverted " "	13.65	16.78
Insoluble " "	10.12	9.59
Nitrogen,	3.70	2.90
Insoluble matter,	1.50	2.65
Valuation per 2,000 lbs.:	$43.27	$44.96

The valuation of ground bones varies, somewhat, on account of differences in their mechanical condition. The majority of these articles are at present of a very advantageous form.

292. L. B. Darling's Fine Ground Bones. Collected of J. H. Fairbanks, Fitchburg, Mass.

Guaranteed composition: phosphoric acid, 22 to 25 per cent.; bone phosphate, 52 to 55 per cent.; nitrogen, 3.5 to 4.5 per cent. (equivalent to ammonia, 4 to 5 per cent.).

293. Belknap & Co.'s Pure Ground Bones. Collected of J. & J. A. Rice, Worcester, Mass.

Guaranteed composition: bone phosphate, 56 to 80 per cent.; phosphoric acid, 24 to 38 per cent.; nitrogen, 4.41 per cent. (equivalent to ammonia, 5.35 per cent).

294. Bowker's Fine Ground Bone. Collected of Foskett & Holbrook, Palmer, Mass.

Guaranteed composition: ammonia, 3 to 4 per cent. (equivalent to nitrogen, 2.5 to 3.3 per cent.); phosphoric acid, 20 to 23 per cent.

295. Adams' Fine Ground Bones. Collected of J. B. Raynor & Co., Springfield, Mass.

Guaranteed composition: phosphoric acid, 18 to 20 per cent.; nitrogen, 4 to 5 per cent. (equivalent to ammonia, 4.5 to 5.5 per cent).

	292	*293*	*294*	*295*
		Pounds per hundred.		
Moisture at 100° C.,	5.00	5.00	10.90	4.90
Total phosphoric acid,	26.53	22.11	20.25	16.78
Soluble " "	0.41	——	0.23	0.26
Reverted " "	8.07	2.67	2.51	2.30
Insoluble " "	17.05	19.44	17.51	14.22
Nitrogen,	4.05	4.52	3.47	4.44
Insoluble matter,	——	——	0.55	3.20
Valuation per 2,000 pounds,	$43.59	$39.09	$32.69	$32.93

296. Bowker's Hill and Drill. Collected of Sprague & Williams, South Framingham, Mass.

Guaranteed composition: nitrogen, 2.5 to 3.25 per cent. (equivalent to ammonia, 3 to 4 per cent.); soluble phosphoric acid, 8 to 10 per cent.; reverted phosphoric acid, 1 to 2 per cent.; total phosphoric acid, 11 to 13 per cent.; potassium sulphate, 2 to 3 per cent.

297. Chittenden's Universal Phosphate. Collected of Slate & DeWolf, Greenfield, Mass.

Guaranteed composition: ammonia, 2.5 to 3.5 per cent. (equivalent to nitrogen, 2 to 2.9 per cent.); soluble and available phosphoric acid, 8 to 10 per cent.; total phosphoric acid, 10 to 12 per cent.; bone phosphate, 22 to 26 per cent.; potassium oxide, 2 to 4 per cent.

298. Complete Fertilizer. Sent on for examination, by farmers of Somerset, Mass.

299. H. J. Baker & Bros.' Complete Manure (potato). Collected of J. B. Raynor & Co., Springfield, Mass.

Guaranteed composition: ammonia, 4 per cent. (equivalent to nitrogen, 3.3 per cent.); phosphoric acid, 5.75 per cent.; potassium oxide, 10 per cent.

	296	*297*	*298*	*299*
Moisture at 100° C.,	13.45	14.48	10.03	8.75
Total phosphoric acid,	10.85	9.43	10.35	7.60
Soluble " "	6.51	7.29	3.04	6.17
Reverted " "	2.02	1.14	3.60	1.19
Insoluble " "	2.33	1.00	3.71	0.24
Nitrogen,	3.45	3.07	4.47	3.78
Potassium oxide,	2.81	2.50	11.44	8.20
Insoluble matter,	—	4.60	1.10	0.65
Valuation per 2,000 lbs,	$33.30	$28.93	$40.05	$33.79

300. Chittenden's Complete Tobacco Fertilizer. Collected of Slate & DeWolf, Greenfield, Mass.

Guaranteed composition: ammonia, 4 to 6 per cent. (equivalent to nitrogen, 3.3 to 5 per cent.); total phosphoric acid, 8 to 10 per cent.; soluble and available phosphoric acid, 6 to 8 per cent.; bone phosphate, 18 to 22 per cent.; potassium sulphate, 8 to 10 per cent.

301. Bradley's XL. Superphosphate of Lime. Collected of Garfield & Procter, Fitchburg, Mass.

Guaranteed composition: nitrogen, 2.5 to 3.25 per cent. (equivalent to ammonia, 3 to 4 per cent.); soluble phosphoric acid, 7 to 8 per cent.; reverted phosphoric acid, 2 to 3 per cent.; available phosphoric acid, 9 to 11 per cent.; total phosphoric acid, 11 to 14 per cent.; insoluble phosphoric acid, 2 to 3 per cent.; potassium oxide, 2 to 3 per cent.; potassium sulphate, 3.7 to 5.55 per cent.

302. Davidge's A. A. Ammoniated Bone Superphosphate. Manufactured by Russell Coe's Co., N. Y. Collected of A. B. Lawrence & Co., Fitchburg, Mass.

Guaranteed composition: moisture, 10 to 15 per cent.; ammonia, 2 to 3 per cent. (equivalent to nitrogen 1.65 to 2.5 per cent.); soluble and available phosphoric acid, 9 to 11 per cent.; insoluble phosphoric acid, 1 to 2 per cent.; total phosphoric acid, 10 to 12 per cent.; potassium oxide, 1.5 to 2.5 per cent.

303. Dow's Ground Bone Fertilizer. Collected of T. Cushing & Co., Fitchburg, Mass.

Guaranteed composition: ammonia, 2.5 to 3 per cent. (equivalent to nitrogen 2 to 2.5 per cent.); phosphoric acid, 18 to 22 per cent.; potassium sulphate, 3 to 3½ per cent.

	300	*301*	*302*	*303*
	Pounds per hundred.			
Moisture at 100° C.,	14.88	11.00	15.05	7.97
Total phosphoric acid,	7.37	11.42	11.31	17.55
Soluble " "	5.76	8.22	4.86	1.22
Reverted " "	.92	1.05	1.78	6.94
Insoluble, " "	.69	2.15	4.68	9.39
Nitrogen,	3.53	3.05	2.28	3.04
Potassium oxide,	7.32	3.41	1.66	2.48
Insoluble matter,	1.93	——	——	4.75
Valuation per 2000 pounds,	$35.72	$34.13	$24.97	$35.37

304. Lister Bros.' Ammoniated Bone Superphosphate. Collected of W. S. Westcott, Amherst, Mass.

Guaranteed composition: moisture 10 to 14 per cent.; available phosphoric acid, 8 to 10 per cent.; insoluble phosphoric acid, 2 to 3 per cent.; potassium oxide, 1.5 to 2 per cent.; ammonia, 2 to 2.5 per cent. (equivalent to nitrogen 1.6 to 2 per cent.).

305. Crocker's Ammoniated Bone Superphosphate. Collected of Slate & De Wolf, Greenfield, Mass.

Guaranteed composition: soluble phosphoric acid, 6 to 8 per cent.; precipitated phosphoric acid, 2 to 4 per cent.; insoluble phosphoric acid, 1 to 2 per cent.; bone phosphate, 18 to 26 per cent.; ammonia, 3.5 to 4.5 per cent. (equivalent to nitrogen 2.9 to 3.7 per cent.); potassium sulphate, 1 to 3 per cent.

306. Mapes' Potato Fertilizer. Collected of W. H. Earle & Co., Worcester, Mass.

Guaranteed composition: ammonia, (ready formed), soluble nitrogen, etc., 4.5 to 5 per cent.; soluble and available phosphoric acid, 8 to 10 per cent.; potassium oxide, (as high grade sulphate and chloride of potash), 6 to 8 per cent.

307. Bowker's "Stockbridge's Manure" (potato). Collected of Wilder & Puffer, Springfield, Mass.

Guaranteed composition: nitrogen, 3.25 to 4.25 per cent. (equivalent to ammonia, 4 to 5 per cent.); soluble and reverted phosphoric acid, 7 to 8 per cent.; total phosphoric acid, 8 to 10 per cent.; potassium oxide, 5 to 6 per cent.

	304	*305*	*306*	*307*
	Pounds per hundred.			
Moisture at 100° C.,	11.75	14.48	12.38	10.08
Total phosphoric acid,	11.65	9.43	12.05	10.06
Soluble " "	6.97	7.29	5.05	5.76
Reverted " "	1.83	1.14	3.24	2.18
Insoluble " "	2.85	1.00	3.76	2.12
Potassium oxide,	1.54	1.60	7.62	4.56
Nitrogen,	2.64	3.07	3.63	4.66
Insoluble matter,	1.60	——	——	3.88
Valuation per 2,000 lbs.,	$28.58	$28.15	$39.14	$36.22

308. Quinnipiac Co.'s (Plain Brand) Fish and Potash. Collected of D. A. Horton, Northampton, Mass.

Guaranteed composition: nitrogen, 2 to 3 per cent. (equivalent to ammonia, 2.5 to 3.5 per cent.); soluble and reverted phosphoric acid, 4 to 6 per cent.; total phosphoric acid, 6 to 8 per cent.; potassium oxide, 4 to 6 per cent.

309. Williams, Clark & Co.'s Fish and Potash. Collected of Foskett & Holbrook, Palmer, Mass.

Guaranteed composition: ammonia, 4 to 5 per cent. (equivalent to nitrogen, 3.3 to 4 per cent.); potassium oxide, 3 to 4 per cent.; phosphoric acid, 3 to 4 per cent.

310. Quinnipiac Co.'s (Cross Brand) Fish and Potash. Collected of B. L. Bragg & Co., Springfield, Mass.

Guaranteed composition: total phosphoric acid, 5 to 7 per cent.; soluble and reverted phosphoric acid, 3 to 5 per cent.; potassium sulphate, 3 to 5 per cent.; nitrogen, 3.25 to 4.25 per cent. (equivalent to ammonia 4 to 5 per cent).

311. Chittenden's Fish and Potash. National Fertilizer Co., Bridgeport, Conn.; collected of Wilder & Puffer, Springfield, Mass.

Guaranteed composition: ammonia, 3 to 4 per cent. (equivalent to nitrogen 2.5 to 3.3 per cent.); phosphoric acid, 8 to 10 per cent.; potassium oxide, 4 to 5 per cent.

	308	*309*	*310*	*311*
		Pounds per	*hundred.*	
Moisture at 100° C.,	24.93	9.63	17.30	9.43
Total phosphoric acid,	7.26	7.51	7.67	7.33
Soluble " "	0.96	0.54	0.83	2.02
Reverted, " "	3.96	2.91	4.06	1.82
Insoluble, " "	2.34	4.06	2.78	3.49
Potassium oxide,	4.78	4.30	4.20	5.91
Nitrogen,	2.73	3.00	4.73	3.12
Insoluble matter,	2.65	0.80	0.82	3.18
Valuation per 2,000 pounds	$23.83	$23.34	$33.34	$25.59

C. A. GOESSMAN, *Director*,

AMHERST, MASS.

The Bulletin of the Experiment Station will be sent free of charge to all parties interested in its work, on application. Applications for II. Annual Report will receive attention as soon as extra copies are received for distribution.

J. E. Williams, Printer, Amherst, Mass.

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AGRICULTURAL EXPERIMENT STATION.

BULLETIN No. 17.

AUGUST, 1885.

Meteorological Summary for month ending July 31st.

Highest temperature,	93.0°
Lowest temperature,	41.0°
Mean temperature,	70.41°
Mean relative humidity,	77.2°
Total rainfall,	2.07 in.
Prevailing winds,	Southwesterly
No. of days on which .01 in. of rain fell,	7
No. of days on which cloudiness averaged 8 or more on scale of 10,	3

Showers of rain were frequent during the first half of the month, but from July 14th to August 1st only .02 of an inch of rain fell, and the drouth became moderately severe.

FODDER ANALYSES.

II. BUNKER MEADOW HAY.

Sent on by the Secretary of the Essex County Agricultural Society.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	11.35	227.00			
Dry Matter,	88.65	1773.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					1 : 9.91
Crude Ash,	6.40	128.00			
" Cellulose,	30.71	614.20	208.83	34	
" Fat,	2.29	45.80	34.81	76	
" Protein, (nitrogenous matter),	7.66	153.20	130.22	85	
Non-nitrogenous extract matter,	52.94	1058.80	995.27	94	
	100.00	2000.00	1369.13		

III. HIGH MEADOW HAY.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	10.60	212.00			
Dry Matter,	89.40	1788.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					1 : 8.12
Crude Ash,	7.58	151.60			
" Cellulose,	27.23	544.60	185.16	34	
" Fat,	2.77	55.40	42.10	76	
" Protein, (nitrogenous matter),	9.33	186.60	158.61	85	
Non-nitrogenous extract matter,	53.09	1061.80	998.09	94	
	100.00	2000.00	1383.96		

The above described samples of hay, II. and III., and No. 278 of the previous bulletin have been examined by the direction of the Secretary of the Essex Agricultural Society for farmers in Topsfield, Mass. The hay had been obtained from meadows in the vicinity of the Ipswich river. No. III. is the most nutritious material, and sample No. II. has a larger amount of digestible matter than No. I.

313. CORN MEAL.

93.28 per cent. passed through mesh, 144 to square inch. Bought of J. L. Holley, South Amherst, Mass.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	11.95	239.00			
Dry Matter, ...	88.05	1761.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	1.59	31.80			1 : 7.42
" Cellulose, ...	2.59	51.80	17.61	34	
" Fat, ...	4.43	88.60	67.34	76	
" Protein, (nitrogenous matter),	13.13	262.60	223.21	85	
Non-nitrogenous extract matter, . .	78.26	1565.20	1471.29	94	
	100.00	2000.00	1779.45		

The analysis represents the average of the composition of the corn meal, fed during our feeding experiments with pigs, November 1st, 1884, to 18th of April, 1885, which will be reported in our next bulletin in detail.

314. MILK.

Average of Analyses of Buttermilk from November 6th, 1884, to February 5th, 1885.

From Amherst Creamery.

Water,	92.00 per cent.
Total solids,	8.00 " "
	100.00

ANALYSIS OF SOLIDS.

Fat,	0.20	per cent.	Nutritive Ratio: 1 : 1.9
Protein (nitrogenous matter),	2.65	" "	
Ash,	0.60	" "	
Non-nitrogenous extract matter,	4.55	" "	
	8.00		

Average of Analyses of Skim Milk from November 6th, 1884, to February 5th, 1885.

From the Experiment Station Farm.

Water,	89.78	per cent.
Total solids,	10.22	" "
	100.00	

ANALYSIS OF SOLIDS.

Fat,	0.33	per cent.	Nutritive Ratio: 1 : 1.8
Protein (nitrogenous matter),	3.53	" "	
Ash,	0.80	" "	
Non-nitrogenous extract matter,	5.56	" "	
	10.22		

ANALYSES OF FRUITS.

The fruits which served for the analysis subsequently reported were obtained from one and the same experimental plat. The soil consisted of a sandy loam in a fair state of cultivation, and had received no special manurial substances for several years.

315. CURRANTS.

	Versailles.	*Cherry.*	*White Grape.*
Specific gravity of juice at 27° C.,	1.049	1.030	——
Moisture in fresh fruit,	87.05	88.12	84.82
Dry matter " "	12.95	11.88	15.18
Ash constituents " "	0.41	0.46	0.59
Nitrogen " "	——	0.17	——

316. Relative proportion of some essential Ash Constituents of Fruits:

	Concord Grape.	*Currants.*	*Blackberries.*
Potassium oxide,	62.29	49.67	51.42
Magnesium oxide,	1.77	6.49	5.30
Calcium oxide,	15.49	19.76	17.22
Ferric oxide,	1.96	1.26	1.43
Phosphoric acid,	18.49	22.82	24.63
	100.00	100.00	100.00

As these results may be of interest to fruit cultivators, on account of the information they give concerning the special requirements of some prominent fruits in soil constituents, they are published here in advance. A more detailed record of this work, which is steadily progressing, has to be deferred for obvious reasons to the next annual report.

ANALYSIS OF WEEDS.

317. SORREL.

(RUMEX ACETOSELLA.)

The plants for the examination were collected during the month of June, when in blossom. The fresh plant contained in one hundred parts:

Moisture,	87.07
Dry matter	11.93
Mineral constituents,	1.11
(including some earthy matter,	0.158)

The fresh plant contains no free volatile acid—as acetic acid, etc. The strong acid reaction and taste of the juice of the plant is largely, if not exclusively, due to the presence of acid combinations of oxalic acid with the alkalies, potassa and soda.

The soluble portion of the ash constituents contains the subsequent substances in the following relative proportions:

Potassium oxide,	19.35 per cent.
Sodium oxide,	10.79 " "
Calcium oxide,	47.53 " "
Magnesium oxide,	8.99 " "
Ferric oxide,	2.55 " "
Phosphoric acid,	10.79 " "
	100.00

The sudden appearance of this well known plant upon lands which, during the preceding season, had been free from the objectionable weed, suggested the previously described examination into its chemical composition. A more systematic inquiry into the chemical character and the habits of many of our weeds cannot fail to give us here and there useful information regarding an intelligent course to lessen their chances of a luxuriant growth.

Good agricultural authorities in Europe state that this variety of sorrel does not grow upon a calcareous soil, but thrives upon a sandy soil of a medium state of fertility. They recommend a liberal application of lime or marl as an effective remedy to check its growth. Judging from the predominance of lime in the mineral constituents of the sorrel, as shown by the above analysis, it seems that the stated beneficial action of lime and marl, if true, has to be ascribed to their modifying influence on the physical and chemical condition of the soil, and not to a deficiency of lime as a special plant food.

The material serving for our analysis grew upon a light sandy soil.

FERTILIZER ANALYSES.

318. MUCK.

Three samples of muck sent on for examination from Goshen, Mass.

	I.	*II.*	*III.*
	Pounds per Hundred.		
Moisture at 100° C.,	63.75	66.80	43.18
Dry matter,	36.25	33.20	56.82
Ash,	17.30	8.55	26.12
Nitrogen in organic matter,	0.75	1.09	0.97

Sample No. I. consisted of a solid, unbroken, turfy mass, with but little change in the original vegetable structure. It contained some lime, with traces of phosphoric acid as more noteworthy mineral constituents. The nitrogen of the vegetable matter is that of a fair quality of its kind, considering the total amount of earthy material present.

Sample No. II. consisted of a black-brown, somewhat pulverent mass, with rootlets here and there interspersed; it contained more lime and phosphoric acid than No. I., but less earthy matter. The smaller percentage of mineral matter accounts sufficiently for an increased amount of nitrogen as compared with No. I.

Sample No. III. consisted mainly of a material similar to No. II., covered largely with a grayish saline mass, of an acid and astringent taste. Treated with water at an ordinary temperature a very acid solution was obtained, which contained a liberal amount of free sulphuric acid, besides a considerable quantity of the combination of this acid with lime (gypsum), and with oxide of iron (green copperas). The presence of these compounds was evidently due to the action of air and of moisture on iron pyrites—a combination of sulphur and iron—contained in the rocks and the soils through which the water percolated which fills the muck-bed.

Wells located in rocks containing iron pyrites are apt to show a similar alteration in their character during the earlier part of the spring after a dry summer and autumn, when in consequence of a lower level of the water supply a more extensive exposure of adjoining rocks have favored the oxidation of both iron and sulphur. This change may assume such proportions at times that the water of these wells will curdle fresh milk, and produce a more or less inklike abstract of green tea.

A repeated pumping out in most instances removes the cause of these reactions. An actual observation in this direction at Amherst a few years ago, after several years of dry seasons, furnished a striking illustration of the previous statement.

A muck like No. III. is decidedly injurious to vegetation, and needs an exceptionally large addition of lime or ashes, and a longer exposure to the air than the average material of this kind, to prepare it for manurial purposes.

319-320. FERTILIZING MATERIALS.

Sent on from Boston, Mass.

	319	*320*
	Pounds per Hundred.	
Moisture at 100° C.,	4.10	6.24
Phosphoric acid,	1.77	0.48
Potassium oxide,	1.35	0.40
Nitrogen,	1.33	0.57
Calcium oxide,	11.44	18.84
Magnesium oxide,	1.36	1.23
Insoluble matter,	48.35	43.53

The materials are evidently mixtures of refuse from various sources, and contain large quantities of insoluble matter. No. 319 is worth from $7 to $8 per ton, and No. 320 from $2.50 to $3.

321. REFUSE LIME.

Sent on for examination from Lowell, Mass.

Moisture at 100° C.,	33.54	per cent.
Phosphoric acid,	1.62	"
Magnesium oxide,	8.30	"
Calcium oxide,	40.57	"
Insoluble matter,	0.40	"

The lime consists of a mixture of calcium oxide and carbonate of lime, and is equal in pecuniary value to air-slacked lime.

POTASH SALTS.

322. Muriate of potash, sent on from Fall River, Mass.

323. Muriate of potash from H. L. Phelps, Southampton, Mass.

	322	323
	Pounds per Hundred.	
Moisture at 100° C.,	2.00	1.50
Potassium oxide,	52.00	51.28
Sodium oxide,	——	8.04
Insoluble matter,	——	2.00

PLASTER.

324. Ground Nova Scotia plaster, collected of B. F. Bridges, South Deerfield, Mass. Sold at $7.50 per ton.

325. Onondaga plaster, collected of B. F. Bridges, South Deerfield, Mass. Sold at $6.00 per ton.

	324	325
	Pounds per Hundred.	
Moisture at 100° C.,	4.07	8.95
Calcium oxide,	33.59	29.80
Sulphuric acid,	47.23	32.68
Insoluble matter,	——	8.95

CANADA WOOD ASHES.

326. Munroe Judson & Stroup, Oswego, N. Y., collected of Edward Swan, South Deerfield, Mass.

327. Munroe Judson & Stroup, Oswego, N. Y., collected of Walter Crafts & Son, Whately, Mass.

328. Sent on for examination from Montague, Mass.

	326	327	328
	Pounds per Hundred.		
Moisture at 100° C.,	16.55	11.95	6.75
Calcium oxide,	34.42	39.60	34.71
Magnesium oxide,	2.52	2.28	2.45
Potassium oxide,	5.36	6.46	6.30
Phosphoric acid,	2.06	1.77	2.21
Insoluble matter,	24.10	10.12	16.10

These samples are of good composition; they are sold at 25 cents per bushel on board of cars. The bushel averages from 45 to 48 pounds.

GROUND BONES.

330. Swift Sure Bone Meal. M. L. Shoemaker & Co., Philadelphia, Pa. Collected of H. L. Phelps, Southampton, Mass.

Guaranteed composition: ammonia, 5 to 6 per cent. (equivalent to nitrogen, 4 to 5 per cent.); bone phosphate, 45 to 50 per cent.

331. Bone Meal. Collected of E. T. Sabin, Amherst, Mass.

No guaranty obtained.

	330	*331*
	Pounds per	*Hundred.*
Moisture at 100° C.,	3.60	5.00
Total phosphoric acid,	20.66	22.64
Soluble " "	——	
Reverted " "	2.24	
Insoluble " "	18.42	
Nitrogen,	6.25	3.01
Insoluble matter,	4.00	
Valuation per 2,000 lbs.:	$44.50	$37.99

332. L. L. Crocker's Hop and Potato Fertilizer. Collected of Merriam & Rolph, Fitchburg, Mass.

Guaranteed composition: soluble phosphoric acid, 6 to 8 per cent.; precipitated phosphoric acid, 2 to 4 per cent.; bone phosphate, 18 to 26 per cent.; insoluble phosphoric acid, 1 to 2 per cent.; ammonia, 2.5 to 3.5 per cent. (equivalent to nitrogen, 2 to 3 per cent.); potassium oxide, 6 to 8 per cent.

333. Adams' Market Bone Fertilizer. Collected of J. B. Raynor & Co., Springfield, Mass.

Guaranteed composition: total phosphoric acid, 10 to 12 per cent.; soluble and available phosphoric acid, 8 to 10 per cent.; nitrogen, 3.5 to 4.5 per cent. (equivalent to ammonia, 4.25 to 5.25 per cent.); potassium oxide, 3 to 4 per cent.

334. Chittenden's Bone Superphosphate; National Fertilizer Co., Bridgeport, Conn. Collected of J. Cushing & Co., Fitchburg, Mass.

Guaranteed composition: ammonia, 2 to 3 per cent. (equivalent to nitrogen, 1.6 to 2.5 per cent.); soluble and available phosphoric acid, 7 to 9 per cent.; total phosphoric acid, 9 to 11 per cent.; bone phosphate, 20 to 24 per cent.; potassium oxide, 2 to 4 per cent.

335. Fertilizer No. 203; Dole Fertilizer Co., Boston. Collected of Frank Sherman, Foxboro', Mass.

Guaranteed composition: nitrogen, 3 to 4 per cent. (equivalent to ammonia, 3.5 to 4.5 per cent.); total phosphoric acid, 10 to 12 per cent.; available phosphoric acid, 8 to 10 per cent.; potassium oxide, 3 to 4 per cent.

	332	*333*	*334*	*335*
		Pounds per hundred.		
Moisture at 100° C.,	12.10	6.55	11.45	8.83
Total phosphoric acid,	9.05	10.68	9.29	10.32
Soluble " "	5.94	3.39	6.16	2.81
Reverted " "	2.10	2.74	1.65	2.18
Insoluble " "	1.01	4.55	1.48	5.33
Potassium oxide,	5.06	3.12	3.28	4.06
Nitrogen,	2.99	4.13	2.51	3.63
Insoluble matter,	——	——	4.50	5.88
Valuation per 2,000 lbs.:	$29.92	$31.65	$26.74	$29.33

336. The Spear Perfect Fertilizer. Collected of B. Spear & Co., Springfield, Mass.

Guaranteed composition: total phosphoric acid, 3.35 per cent.; potassium oxide, 0.65 per cent.; ammonia, 0.93 per cent. (equivalent to nitrogen, 0.77 per cent.).

337. Baker's A. A. Ammoniated Bone Phosphate. Collected of J. B. Raynor & Co., Springfield, Mass.

Guaranteed composition: ammonia, 3 to 4 per cent. (equivalent to nitrogen, 2.5 to 3.3 per cent.); available phosphoric acid, 10 to 12 per cent.; potassium oxide, 2 to 3 per cent.

338. Bradley's X L Ammoniated Bone Superphosphate. Collected of D. A. Wright, Northampton, Mass.

Guaranteed composition: nitrogen, 2.5 to 3.25 per cent. (equivalent to ammonia, 3 to 4 per cent.); soluble phosphoric acid, 7 to 8 per cent.; reverted phosphoric acid, 2 to 3 per cent.; insoluble phosphoric acid, 2 to 3 per cent.; total phosphoric acid, 11 to 14 per cent.; potassium oxide, 2 to 3 per cent. (equivalent to potassium sulphate, 3.7 to 5.55 per cent.).

339. George W. Miles' I X L Ammoniated Bone Superphosphate. Collected of B. F. Bridges, So. Deerfield, Mass.

Guaranteed composition: ammonia, 2.5 to 4 per cent. (equivalent to nitrogen, 2 to 3.3 per cent.); available phosphoric acid, 8 to 12 per cent.; potassium oxide, 1 to 3 per cent.

	336	337	338	339
		Pounds per Hundred.		
Moisture at 100° C.,	20.23	9.78	14.82	17.70
Total phosphoric acid,	7.52	11.63	12.55	12.14
Soluble " "	0.32	10.46	8.32	6.78
Reverted " "	6.09	0.83	2.59	2.53
Insoluble " "	1.11	0.34	1.64	2.93
Potassium oxide,	0.40	2.14	1.85	1.04
Nitrogen,	0.62	3.60	3.43	2.17
Insoluble matter,	33.35	1.25	4.23	5.70
Valuation per 2,000 lbs.:	$13.79	$35.21	$35.46	$27.28

340. Prepared Phosphate of Lime; United States and Canada Co-operative Fertilizer Co., Boston. Collected of W. B. Howe, Marlboro, Mass.

Guaranteed composition: moisture, 12 to 15 per cent.; ammonia, 1.5 to 2.5 per cent. (equivalent to nitrogen, 1.2 to 2 per cent.); available phosphoric acid, 8 to 11 per cent.; potassium sulphate, 4 to 6 per cent. (equivalent to potassium oxide, 2.15 to 3.23 per cent.); insoluble matter, 2 to 6 per cent.

341. Fertilizer No. 203, of Dole Fertilizer Co., Boston. Collected of J. H. Lathrop, Boston.

Guaranteed composition: nitrogen, 3 to 4 per cent. (equivalent to ammonia, 3.5 to 4.5 per cent.); total phosphoric acid, 10 to 12 per cent.; available phosphoric acid, 8 to 10 per cent.; potassium oxide, 3 to 4 per cent.

342. Soluble Pacific Guano; Pacific Guano Co., Glidden & Curtis, Boston. Collected of E. C. Haskell, So. Deerfield, Mass.

Guaranteed composition: moisture 15 to 18 per cent.; ammonia, 2.5 to 3.5 per cent. (equivalent to nitrogen, 2 to 2.9 per cent.); potassium oxide, 2 to 3.5 per cent.; available phosphoric acid, 8 to 10 per cent.; soluble phosphoric acid, 6.5 to 8 per cent.; insoluble phosphoric acid, 2 to 3 per cent.; total phosphoric acid, 12 to 14 per cent.

343. George W. Miles & Co.'s Fish and Potash. Collected of B. F. Bridges, So. Deerfield, Mass.

Guaranteed composition: ammonia, 3 to 5 per cent. (equivalent to nitrogen, 2.5 to 4 per cent.); available phosphoric acid, 5 to 8 per cent.; potassium oxide, 3 to 5 per cent. as sulphate.

	340	341	342	343
		Pounds per Hundred.		
Moisture at 100° C.,	10.63	11.13	14.03	14.45
Total phosphoric acid,	12.54	10.83	12.03	10.09
Soluble " "	6.32	2.62	6.90	5.06
Reverted " "	2.13	3.08	1.83	0.96
Insoluble " "	4.09	5.13	3.30	4.07
Potassium oxide,	3.20	3.98	2.04	4.90
Nitrogen,	2.05	3.27	2.17	3.09
Insoluble matter,	6.50	8.60	5.40	4.75
Valuation per 2,000 lbs.:	$30.08	$28.90	$27.53	$32.13

344. Prepared Phosphate of Lime; United States and Canada Cooperative Fertilizer Co., Boston. Collected of J. N. Brown, North Brookfield, Mass.

No guarantee obtained.

345. Darling's Animal Fertilizer; collected of W. S. Westcott, Amherst, Mass.

Guaranteed composition: Ammonia, 4 to 8 per cent. (equivalent to nitrogen, 3.3 to 6.6 per cent.); phosphoric acid, 10 to 12 per cent.; potassium oxide, 4 to 6 per cent.

346. Bowker's Fish and Potash; collected of W. S. Westcott, Amherst, Mass.

Guaranteed composition: Nitrogen, 2.5 to 3.25 per cent. (equivalent to ammonia, 3 to 4 per cent.); phosphoric acid, 3 to 4 per cent.; bone phosphate, 18 to 22 per cent.; potassium oxide, 4 to 6 per cent.

347. Fertilizing material sent on for examination by Farmers' Club, Lanesboro, Mass.

No guarantee obtained.

	344	345	346	347
		Pounds per Hundred.		
Moisture at 100° C.,	13.00	14.50	8.30	10.59
Total phosphoric acid,	11.02	11.08	10.38	12.06
Soluble phosphoric acid,	5.81	0.34	3.08	6.78
Reverted " "	2.17	2.36	2.86	3.34
Insoluble " "	3.04	8.38	4.44	1.94
Potassium oxide,	5.10	3.94	4.98	0.82
Nitrogen,	2.23	3.30	2.64	3.13
Insoluble matter,	5.00	——	——	4.28
Valuation per 2000 pounds,	$28.72	$26.33	$27.40	$31.06

C. A. GOESSMANN, Director,
Amherst, Mass.

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BULLETIN No. 18.

OCTOBER, 1885.

Meteorological Summary for two months ending September 30th.

	AUGUST.	SEPTEMBER.
Highest temperature,	87.0°	81.0°
Lowest temperature,	34.0°	27.0°
Mean temperature,	66.05°	58.32°
Mean relative humidity,	79.5° per cent.	82.3° per cent
Total rainfall,	8.31 in.	0.85 in.
Prevailing winds.	Southwesterly.	Southwesterly.
No. of days on which .01 in. of rain fell,	13	5
No. of days on which cloudiness averaged 8 or more on scale of 10,	9	4

The rainfall in August was greater than in the corresponding month for eighteen years past. September presents the opposite extreme for a period of twenty years. A light frost was reported on low lands August 27th, and others occurred September 3d, 6th, 11th, 12th, 21st and 24th, but at the close of this month no serious damage had been done, and only slight effects of frost were visible.

NOTES ON FEEDING EXPERIMENTS WITH PIGS.

348. In BULLETIN NO. 13 has been described the first of a series of feeding experiments with pigs, which were planned for the purpose of studying the comparative feeding value of skim milk from the farm, and of buttermilk from the Amherst Creamery, in connection with corn meal, for the production of pork. Equal *measures* of skim milk and of creamery buttermilk had been fed with an addition of a corresponding *weight* of corn meal, in each case. *Three ounces of corn meal for every quart of each kind of milk consumed* formed the basis for the compounding of the entire diet of the (six) animals on trial. The daily amount of feed required was regulated by the appetite of each animal.

A summary of the results obtained in that connection showed that —taking corn meal pound for pound, and skim milk and creamery buttermilk quart for quart—practically the same quantity of dressed pork had been obtained in both cases when stating the final weight of each lot of animals—three in number—in one sum; 510 pounds where skim milk and meal had been fed, and 514 pounds in the case of buttermilk and meal. Counting in each case the particular feed (milk and meal) with regard to the amount of *dry organic matter*, which it contained, it was noticed that the buttermilk feed had proved—taking pound for pound of dry matter of the mixture—the most nutritious article; for 2.4 pounds of dry organic matter contained in the buttermilk and corn meal feed, had produced, as mean results, one pound of dressed pork, whilst in the case of skim milk and meal, 2.9 pounds of dry organic matter had been spent in the production of one pound.

The lot of animals fed with creamery buttermilk and corn meal had also returned a larger profit, even at the rates of the cost of each constituent of the diet, ruling during the period of feeding—May to September, 1884. These results were in so far of special interest as the *skim milk* from the farm was the more concentrated and richer article of the two kinds of milk fed, according to special chemical analyses made at various times; the skim milk had contained more than 20 per cent. more dry organic matter than the creamery buttermilk. This circumstance seemed to indicate a waste of skim milk, as compared with the results obtained in case of the former. As the skim milk was the most costly article of the feed, a waste of that article cannot otherwise but seriously affect the cost of the dressed pork obtained by its use.

In our first experiment—1884—the corn meal was charged $28 per ton at the mill; creamery buttermilk, 1.37 cts. per gallon, the contractor's price; and farm skim milk, 2 cents asked for at the farm. Cost of feed per pound of dressed pork at these rates amounted in case of the creamery milk feed to 4.6 cts., and in case of the farm skim milk feed to 5.8 cents per pound.

As a charge of 2 cents per gallon for skim milk may be considered somewhat arbitrary, its commercial value for feeding purposes has been based with more propriety, in our subsequent experiments, on the amount of solid matter it contains as compared with that of the creamery buttermilk, taking the contractor's price of the latter as the standard.

	Percentage of Solids.		*Cost per Gallon, cts.*	
	1884.	*1885.*	*1884.*	*1885.*
Creamery Buttermilk,	7.09	8.00	1.37	1.37
Farm Skim Milk,	9.58	10.22	1.78	1.75

A recalculation of the cost of feed consumed in our *first* experiment (1884) at the rates adopted in our second experiment (1885), described within these pages, does not alter the financial results of that experiment so far as the *relative* cost of *each kind* of feed is concerned.

	Cost of Feed per lb. of Dressed Pork.	
	1884.	*1885.*
Creamery Buttermilk and Meal,	4.6 cts.	4.20 cts.
Farm Skim Milk and Meal,	5.8 cts.	4.85 cts.

The previous short discussion of the first feeding experiment, reported in BULLETIN No. 13 (also II. Annual Report), seemed to be necessary in the interest of a desirable understanding of the subsequent description of the second feeding experiment, beginning Nov. 5th, 1884, and ending March 17th, 1885.

Second Feeding Experiment.—Twelve pigs served in this trial; all were barrows. Six of them were crosses of Berkshire sow with Yorkshire boar; their individual weights varied from 38 to 46 lbs.; the remaining six animals were crosses of Chester White sow, with Yorkshire boar, weighing from 15 to 19 lbs. each. They were arranged for the experiment in two lots,—A and B,—each containing three of the former and three of the latter breed. The first three numbers in each lot are the heavier animals (Berkshire).

Lot A (1, 2, 3, 4, 5 and 6,) was fed with *Creamery Buttermilk* and *Corn Meal*, at the rate of *three ounces* of *Corn Meal* for *every quart* of milk consumed, until the quantity of milk required per day, to meet the individual want of each animal, amounted to from twelve to thirteen quarts, when the increase of milk for the daily diet ceased. The subsequent still steadily increasing demand for more feed was supplied by a gradual increase of corn meal, rising from three to four, five, six, and finally to seven and one-half ounces of meal for every quart of butter milk. The experiment terminated with ninety-two ounces of corn meal to twelve quarts of milk.

Lot B (7, 8, 9, 10, 11 and 12,) was fed with *Skim Milk* from the farm, and *Corn Meal*, at the following rates: Nos. 7, 8 and 9, (Berkshire) received from the 5th of November to the 9th of December *two ounces* of *meal* for *every quart of skim milk* consumed; from the 9th of December to the 15th of January, *four ounces* of meal to *every quart* of milk. The meal was subsequently gradually raised to *eight ounces per quart* of milk. The consumption of milk had reached ten quarts per day, when the want of skim milk necessitated (Feb. 7th) a change in the course of feeding adopted for this lot of pigs. *Creamery Buttermilk* and *Meal—six ounces* of meal for *every quart* of the latter—were substituted; at that period seventy-two ounces of meal and twelve quarts of milk were fed. The experiment was continued in the same manner as Nos. 1, 2 and 3, of Lot A, until the 17th of March.

The second half of Lot B (Nos. 10, 11 and 12,) received from November 5th to December 9th *two ounces* of meal for *every quart* of skim milk consumed; from the 9th of December to the 14th of January, *four ounces;* from the 14th of January to the 17th of February, from *five* to *five and one-half ounces* of meal per quart. At this stage of the experiment, when the daily consumption of the milk had reached from *six* to *seven quarts*, the increase of milk ceased; the call for additional feed during the remainder of the experiment was supplied by a gradual increase of meal until March 25th, when the animals were killed. The daily consumption of meal had reached, one week before the close of the experiment, one hundred and eight ounces, or 6¾ pounds, in case of every animal of this division of lot B, which proved to be the most profitable one of the entire experiment.

The tabular statement which follows aims at a more concise presentation of numerical relations regarding important points of the entire experiment, as far as every individual animal, as well as each lot is concerned. A summary of results, which closes the detailed statements, shows that Lot B, on the whole, has given the best returns, with the second division leading. The superior quality of the *skim milk* (Lot B) is rendered quite conspicuous by a saving of three hundred and sixty gallons of milk, and an increased production of one hundred and one pounds of dressed pork, as compared with the use of the creamery butter milk, (Lot B,) with practically a corresponding quantity of corn meal under otherwise corresponding conditions.

The results of our first experiment were reversed, as might have been expected, by a more judicious distribution of an increased proportion of meal at the various stages of growth. The cost of the entire feed consumed by Lot A amounted to $51.00; and that of Lot B to $53.02; whilst the cost of feed for the production of one pound of dressed pork in Lot A amounted to 5.73 cts., and that of Lot B amounted to 5.37 cts. The influence of a severe winter, and thus generally a lower temperature, during the second experiment, (Nov. to March,) has no doubt exerted a depressing influence on the total results, when compared with the results of the first experiment, (May to September).

No. of Pounds of Dry Matter in feed required to Produce one Pound of Dressed Pork.

	I. 1884. *Summer.*	*II. 1885.* *Winter.*
Creamery Butter Milk, Feed,	2.4 lbs.	3.67 lbs.
Skim Milk, Feed,	2.9 lbs.	3.33 lbs.

Aside from the stated facts, there are some other points of a more general character deserving of mention in this connection, which are not infrequently underestimated in the feeding of pigs for the market.

First.—A careful preparation of the feed for young pigs, with reference to a *higher nutritious character at the beginning*, and to a gradually *increasing bulk for the proper distention of the digestive organs*, to make them hereafter good eaters. A liberal supply of milk, with a gradual increase of meal, beginning with from one to two ounces of meal per quart, has served us well.

Second.—A *timely closing up* of the fattening process in the *interest* of *profits*, for the best returns of the feed are obtained in the earlier periods of growth; in our case, as a rule, profits were doubtful after the animal reached a weight of from 180 to 200 pounds. There may be exceptions to this observation when the cost of feed is low, and the market price of dressed pork very high, a circumstance not often happening.

We sold our dressed pork at 6¾ cents per pound.

A good illustration in this direction may be furnished by a detailed record of actual results in the case of pigs No. 10, 11 and 12, of Lot B, (pigs fed with skim milk and meal.)

		Live weight of animal at the close of Feeding Period, in Pounds.	Gain in Live Weight during Period, in Pounds.	One hundred Pounds of dry matter in feed had produced, live weight, in pounds.	Cost of feed for production of one pound of live weight *in cts.*
No. 10.	I. Feeding Period,	48.5	30.0	82.0	2.13
	II. “ “	98.5	50.0	55.1	2.98
	III. “ “	152.0	53.5	39.1	4.90
	IV. “ “	209.0	57.0	23.8	6.12
No. 11.	I. Feeding Period,	45.5	28.5	77.9	2.25
	II. “ “	89.5	44.0	48.5	3.38
	III. “ “	138.0	48.5	35.4	4.52
	IV. “ “	191.0	53.0	22.1	6.60
No. 12.	I. Feeding Period,	48.0	30.0	82.0	2.13
	II. “ “	97.5	49.5	54.5	3.01
	III. “ “	147.5	50.0	36.4	4.38
	IV. “ “	216.0	68.5	28.6	5.10

As the difference of live weight and dressed weight in the case here under discussion amounts on an average to $18\frac{3}{4}$ lbs. per hundred weight, and as we sold our dressed pork at $6\frac{3}{4}$ cts. per pound, we lost money on the feed whenever its cost exceeded 5.49 cts. per pound of *live weight* gained; in other words, in only one case, that of No. 12, did we make money during the IV. feeding period of our trial by converting the feed into live weight. These relations appear most striking in feeding periods of equal length, and of about four weeks duration. Our younger animals showed, in every case, a larger gain in live weight during the first period of feeding than the heavier ones, showing the advantages of beginning well at an early stage of growth.

A. BUTTERMILK AND CORN MEAL.

NUMBER ONE.

PERIODS.	Total amount of Meal consumed during period, (in lbs.)	Total quantity of Milk consumed during period (in quarts.)	Total amount of dry matter in Meal consumed during period.	Total amount of dry matter in Milk consumed during period.	Nutritive Ratio of Food.	Weight of animal at beginning of period.	Weight of animal at end of period	Gain in weight per day during period.
1884 and 1885.								*Lb. Oz.*
Nov. 5 to Jan. 27.	156.8	796.0	137.0	137.1	1:3.5	43.5	144.5	1 4
Jan. 27 " Feb. 3.	28.0	86.5	24.5	14.9	1:4.	144.5	171.5	3 14
Feb. 3 " Feb. 27.	111.8	288.0	97.7	49.7	1:4.4	171.5	205.5	1 7
Feb. 27 " Mar. 17.	102.4	216.0	89.5	37.3	1:4.8	205.5	231.0	1 7

Total amount of feed consumed from Nov. 5, 1884 to March 17, 1885.

399 lbs. Corn Meal,	equal to dry matter,	349 lbs.
1386 qts. Butter Milk,	" " " "	239 "
Total amount of Dry Matter,		588 "

Live weight of animal at beginning of experiment,	43.5 lbs.
Live weight at time of killing,	231.0 "
Live weight gained during experiment,	188.5 "
Dressed weight at time of killing,	195.0 "
Loss in weight by dressing, 36 lbs., or 16 per cent.	
Dressed weight gained during experiment,	159.0 "

Cost of feed consumed during the experiment.

399 lbs. Corn Meal, at $22.50 per ton,	$4.49
346 gals. Butter Milk, at 1.37c. per gal.,	4.75
	$9.24

3.13 lbs. of dry matter fed yielded one pound of live weight; and 3.69 lbs. of dry matter yielded one pound of dressed weight.

Cost of feed for production of 1 lb. of dressed pork, 5.81 cents.

A. BUTTERMILK AND CORN MEAL.

NUMBER TWO.

PERIODS.	Total amount of Meal consumed during period, (in lbs.)	Total amount of Milk consumed during period, (in quarts.)	Total amount of dry matter in Meal consumed during period.	Total amount of dry matter in Milk consumed during period.	Nutritive Ratio of Food.	Weight of animal at beginning of period.	Weight of animal at end of period.	Gain in weight per day during period.	
1884 and 1885.								***Lb.***	***Oz.***
Nov. 5 to Jan. 27.	156.8	796.0	137.0	137.1	1: 3.5	46.0	156.5	1	5
Jan. 27 " Feb. 3.	28.0	86.5	24.5	14.9	1: 4.	156.5	171.0	2	1
Feb. 3 " Feb. 27.	111.8	288.0	97.7	49.7	1: 4.4	171.0	220.0	2	1
Feb. 27 " Mar. 17.	102.4	216.0	89.5	37.3	1: 4.8	220.0	247.0	1	8

Total amount of feed consumed from Nov. 5, 1884 to March 17, 1885.

399 lbs. of Corn Meal, equal to Dry matter,	349 lbs.
1386 qts. Butter Milk, " " " "	239 "
Total amount of Dry Matter,	588 "
Live weight of animal at beginning of experiment,	46 lbs.
Live weight at time of killing,	247 "
Live weight gained during experiment,	201 "
Dressed weight at time of killing,	204 "
Loss in weight by dressing, 43 lbs., or 17.5 per cent.	
Dressed weight gained during experiment,	168 "

Cost of feed consumed during experiment.

399 lbs. Corn Meal, at $22.50 per ton,	$4.49
346 gals. Butter Milk, at 1.37c. per gal.,	4.75
	$9.24

2.93 lbs. of dry matter yielded one pound of live weight; and 3.54 lbs. of dry matter yielded one lb. of dressed weight.

Cost of feed for production of 1 lb. of dressed pork, 5.56 cents.

A BUTTERMILK AND CORN MEAL.

NUMBER THREE.

PERIODS.	Total amount of Meal consumed during period, (in lbs.)	Total amount of Milk consumed during period, (in quarts.)	Total amount of dry matter in Meal consumed during period.	Total amount of dry matter in Milk consumed during period.	Nutritive Ratio of Food.	Weight of animal at beginning of experiment.	Weight of animal at end of experiment.	Gain in weight per day during period.	
1884 and 1885.								***Lb.***	***Oz.***
Nov. 5 to Jan. 27.	156.8	796.0	137.0	137.1	1: 3.5	38	150.0	1	6
Jan. 27 " Feb. 3.	28.0	86.5	24.5	14.9	1: 4.	150	153.0	0	7
Feb. 3 " Feb. 27.	111.8	288.0	97.7	49.7	1: 4.4	153	198.0	1	14
Feb. 27 " Mar. 17.	102.4	216.0	89.5	37,3	1: 4.8	198	218.5	1	2

Total amount of feed consumed from Nov. 5, 1884 to March 17, 1885.

399 lbs. Corn Meal, equal to Dry Matter,	349 lbs.
1386 qts. Butter Milk, " " " "	239 "
Total amount of Dry Matter,	588 "

Live weight of animal at beginning of experiment,	38.0 lbs.
Live weight at time of killing,	218.5 "
Live weight gained during experiment,	180.5 "
Dressed weight at time of killing,	218.5 "
Loss in weight by dressing, 35.5 lbs., or 16.13 per cent.	
Dressed weight gained during experiment,	151.0 "

Cost of feed consumed during the experiment.

399 lbs. of Corn Meal, at $22.50 per ton,	$4.49
346 gals. Butter Milk, at 1.37c. per gal.,	4.75
	$9.24

3.25 lbs. of dry matter fed yielded one pound of live weight; and 3.9 lbs. of dry matter yielded one pound of dressed weight.

Cost of feed for production of 1 lb. of dressed pork, 6.1 cents.

A

BUTTERMILK AND CORN MEAL.

NUMBER FOUR.

Periods.	Total amount of Meal consumed during period, (in lbs.)	Total amount of Milk consumed during period, (in quarts.)	Total amount of dry matter in Meal consumed during period.	Total amount of dry matter in Milk consumed during period.	Nutritive Ratio of Food.	Weight of animal at beginning of period.	Weight of animal at end of period.	Gain in weight per day during period.	
1884 and 1885.								*Lb.*	*Oz.*
Nov. 5 to Jan. 27.	96	490	84.0	84.5	1:3.5	19.0	101.0	1	0
Jan. 27 " Feb. 25.	101	321	88.0	55.3	1: 4	101.0	135.5	1	5
Feb. 25 " Mar. 17.	88	228	76.7	39.3	1: 4.4	135.5	161.5	1	5
Mar. 17 " Mar. 26.	53	108	46.2	18.6	1: 4.8	161.5	165.0	0	6

Total amount of feed consumed from Nov. 5, 1884 to March 26, 1885.

338 lbs. Corn Meal, equal to Dry Matter,	295.0 lbs.
1147 qts. Butter Milk, " " " "	197.7 "
Total amount of Dry Matter,	492.7 "

Live weight of animal at beginning of experiment,	19 lbs.
Live weight at time of killing,	165 "
Live weight gained during experiment,	146 "
Dressed weight at time of killing,	133 "
Loss in weight by dressing, 32 lbs., or 19.5 per cent.	
Dressed weight gained during experiment,	118 "

Cost of feed consumed during the experiment.

338 lbs. Corn Meal, at $22.50 per ton,	$3.80
287 gals. Butter Milk, at 1.37c. per gal.,	3.93
	$7.73

3.37 lbs. of dry matter yielded one pound of live weight; and 4.17 lbs. of dry matter yielded one pound of dressed weight.

Cost of feed for production of 1 lb. of dressed pork, 6.55 cents.

A. BUTTERMILK AND CORN MEAL.

NUMBER FIVE.

PERIODS.	Total amount of Meal consumed during period, (in lbs.)	Total amount of Milk consumed during period, (in quarts.)	Total amount of dry matter in Meal consumed during period.	Total amount of dry matter in Milk consumed during period.	Nutritive Ratio of Food.	Weight of animal at beginning of period.	Weight of animal at end of period.	Gain in weight per day during period.	
1884 and 1885.								***Lb.***	***Oz.***
Nov. 5 to Jan. 27.	96	490	84.0	84.5	1:3.5	19	102	1	0
Jan. 27 " Feb. 25.	101	321	88.0	55.3	1:4.	102	148	1	9
Feb. 25 " Mar. 17.	88	228	76.6	39.3	1:4.4	148	188	2	0
Mar. 17 " Mar. 26.	53	408	46.2	18.6	1:4.8	188	198	1	2

Total amount of feed consumed from Nov. 5, 1884 to March 26, 1885.

338 lbs. Corn Meal, equal to Dry Matter,	295. lbs.
1147 qts. Butter Milk, " " " "	197.7 "
Total amount of Dry Matter,	492.7 "

Live weight of animal at beginning of experiment,	19.0 lbs.
Live weight at time of killing,	198.0 "
Live weight gained during experiment,	179.0 "
Dressed weight at time of killing,	161.5 "
Loss in weight by dressing, 36.5 lbs., or 18.4 per cent.	
Dressed weight gained during experiment,	146.0 "

Cost of feed consumed during the experiment.

338 lbs. Corn Meal, at $22.50 per ton,	$3.80
287 gals. Butter Milk, at 1.37c. per gal.,	3.93
	$7.73

2.75 lbs. of dry matter yielded one pound of live weight; and 3.4 lbs. of dry matter yielded one pound of dressed weight.

Cost of feed for production of 1 lb. of dressed pork, 5.29 cents.

A. BUTTERMILK AND CORN MEAL.

NUMBER SIX.

PERIODS.	Total amount of Meal consumed during period, (in lbs.)	Total amount of Milk consumed during period, (in quarts.)	Total amount of dry matter in Meal consumed during period.	Total amount of dry matter in Milk consumed during period.	Nutritive Ratio of Food.	Weight of animal at beginning of period.	Weight of animal at end of period.	Gain in weight per day during period.	
1884 and 1885.								***Lb.***	***Oz.***
Nov. 5 to Jan. 27.	96	490	84.0	84.5	1:3.5	15.0	107.5	1	2
Jan. 27 " Feb. 25.	101	321	88.0	55.3	1:4.	107.5	155.0	1	10
Feb. 27 " Mar. 17.	88	228	76.7	39.3	1:4.4	155.0	191.0	1	13
Mar. 17 " Mar. 26.	53	108	46.2	18.6	1:4.8	191.0	198.5	0	13

Total amount of feed consumed from Nov. 5, 1884 to March 26, 1885.

338 lbs. Corn Meal, equal to Dry Matter, 295.0 lbs.
1147 qts. Butter Milk, " " " " 197.7 "
Total amount of Dry Matter, 492.7 "

Live weight of animal at beginning of experiment, 15.0 lbs.
Live weight at time of killing, 198.5 "
Live weight gained during experiment, 183.5 "
Dressed weight at time of killing, 159.5 "
Loss in weight by dressing, 39 lbs., or 19.6 per cent.
Dressed weight gained during experiment, 147.5 "

Cost of feed consumed during experiment.

338 lbs. Corn Meal, at $22.50 per ton, $3.80
287 gals. Butter Milk, at 1.37c. per gal., 3.93
$7.73

2.68 lbs. of dry matter yielded one pound of live weight; and 3.34 lbs. of dry matter yielded one pound of dressed weight.

Cost of feed for production of 1 lb. of dressed pork, 5.24 cents.

B SKIM MILK AND CORN MEAL.

NUMBER SEVEN.

PERIODS.	Total amount of Meal consumed during period, (in lbs.)	Total amount of Milk consumed during period, (in quarts.)	Total amount of dry matter in Meal consumed during period.	Total amount of dry matter in Milk consumed during period.	Nutritive Ratio of Food.	Weight of animal at beginning of experiment.	Weight of animal at end of experiment.	Gain in weight per day during period.	
1884.								***Lb.***	***Oz.***
Nov. 5 to Dec. 9.	24.5	197	21.5	44.7	1:2.7	37	69	0	15
1885.									
Dec. 9 " Jan. 27.	121.0	452	105.4	102.6	1:4.	69	160	1	14
Jan. 27 " Feb. 3.	28.0	70	24.5	15.8	1:3.9	160	171	1	9
Feb. 3 " Feb. 7.	19.0	36	16.4	8.1	1:4.3	171	179	2	0
Feb. 7 " Mar. 17.	196.0	B'MILK. 456	171.4	78.7	1:4.7	179	254	2	0

Total amount of feed consumed from Nov. 5, 1884 to March 17, 1885.

388.5 lbs. Corn Meal,	equal to Dry Matter,	339.2 lbs.
755 qts. Skim Milk,	" " " "	171.2 "
456 " Butter Milk,	" " " "	78.7 "
Total amount of Dry Matter,		589.1 "

Live weight at beginning of experiment,	37.0 lbs.
Live weight at time of killing,	254.0 "
Live weight gained during experiment,	217.0 "
Dressed weight at time of killing,	208.5 "
Loss in weight by dressing, 45.5 lbs., or 17.8 per cent.	
Dressed weight gained during experiment,	178.0 "

Cost of feed consumed during experiment.

388.5 lbs. Corn Meal, at $22.50 per ton,	$4.37
189 gals. Skim Milk, at 18c. per gal.,	3.40
114 gals. Butter Milk, at 1.37c. per gal.,	1.56
	$9.33

2.71 lbs. of dry matter yielded one pound of live weight; and 3.31 lbs. of dry matter yielded one pound of dressed weight.

Cost of feed for production of 1 lb. of dressed pork, 5.24 cents.

B. SKIM MILK AND CORN MEAL.

NUMBER EIGHT.

PERIODS.	Total amount of Meal consumed during period, (in lbs.)	Total amount of Milk consumed during period, (in quarts.)	Total amount of dry matter in Meal consumed during period.	Total amount of dry matter in Milk consumed during period.	Nutritive Ratio of Food.	Weight of animal at beginning of period.	Weight of animal at end of period.	Gain in weight per day during period.	
1884.								*Lb.*	*Oz.*
Nov. 5 to Dec. 9.	24.5	197.0	21.5	44.7	1: 2.7	41.5	74,0	0	15
1885.									
Dec. 9 " Jan. 27.	121.0	452.0	105.4	102.6	1: 4.	74.0	152.5	1	9
Jan. 27 " Feb. 3.	28.0	70.0	24.5	15.8	1: 3.9	152.5	176.0	3	6
Feb. 3 " Feb. 7.	19.0	36.0	16.4	8.1	1: 4.3	176.0	178.0	0	8
Feb. 7 " Mar. 17.	196.0	B MILK. 456.0	171.4	78.7	1: 4.7	178.0	243.0	1	11

Total amount of feed consumed from Nov. 5, 1884 to March 17, 1885.

388.5 lbs. Corn Meal,	equal to Dry Matter,	339.2 lbs.
755 qts. Skim Milk,	" " " "	171.2 "
456 qts. Butter Milk,	" " " "	78.7 "
Total amount of Dry Matter,		589.1 "

Live weight at beginning of experiment,	41.5 lbs.
Live weight at time of killing,	243.0 "
Live weight gained during experiment,	201.5 "
Dressed weight at time of killing,	205.0 "
Loss in weight by dressing, 38 lbs., or 15.6 per cent.	
Dressed weight gained during experiment,	170.0 "

Cost of feed consumed during experiment,

388.5 lbs. Corn Meal, at $22.50 per ton,	$4.37
189 gals. Skim Milk, at 1.8c. per gal.,	3.40
114 gals. Butter Milk, at 1.37c. per gal.,	1.56
	$9.33

2.9 lbs. of dry matter yielded one pound of live weight; and 3.47 lbs. of dry matter yielded one pound of dressed weight.

Cost of feed for production of 1 lb. of dressed pork, 5.48 cents.

B SKIM MILK AND CORN MEAL.

NUMBER NINE.

PERIODS.	Total amount of Meal consumed during period, (in lbs.)	Total amount of Milk consumed during period, (in quarts.)	Total amount of dry matter in Meal consumed during period.	Total amount of dry matter in Milk consumed during period.	Nutritive Ratio of Food.	Weight of animal at beginning of period.	Weight of animal at end of period.	Gain in weight per day during period.	
								Lb.	*Oz.*
1884. Nov. 5 to Dec. 9.	24.5	197	21.5	44.7	1: 2.7	40.0	77.0	1	1
1885. Dec. 9 " Jan. 27.	121.0	452	105.4	102.6	1: 4	77.0	160.5	1	11
Jan. 27 " Feb. 3.	28.0	70	24.5	15 8	1: 3.9	160.5	171.0	1	8
Feb. 3 " Feb. 7.	19.0	36	16.4	8.1	1: 4.3	171.0	179.5	2	2
Feb. 7 " Mar. 17.	196.0	B'MILK 456	171.4	78.7	1: 4.7	179.5	249.0	1	13

Total amount of feed consumed from Nov. 5, 1884 to March 17, 1885.

388.5 lbs. Corn Meal, equal to Dry Matter,	339.2 lbs.
755 qts. Skim Milk, " " " "	171.2 "
456 qts. Butter Milk, " " " "	78.7 "
Total amount of Dry Matter,	589.1 "

Live weight at beginning of experiment,	40.0 lbs.
Live weight at time of killing,	249.0 "
Live weight gained during experiment,	209.0 "
Dressed weight at time of killing,	209.0 "
Loss in weight by dressing, 40 lbs., or 16 per cent.	
Dressed weight gained during experiment,	174.5 "

Cost of feed consumed during experiment.

385.5 lbs. Corn Meal, at $22.50 per ton,	$4.37
189 gals. Skim Milk, at 1.8c. per gal.,	3.40
114 gals. Butter Milk, at 1.37c. per gal.,	1.56
	$9.33

2.81 lbs. of dry matter yielded one pound of live weight; and 3.37 lbs. of dry matter yielded one pound of dressed weight.

Cost of feed for production of 1 lb. of dressed pork, 5.35 cents.

B SKIM MILK AND CORN MEAL.

NUMBER TEN.

PERIODS.	Total amount of Meal consumed during period, (in lbs.)	Total amount of Milk consumed during period, (in quarts.)	Total amount of dry matter in Meal consumed during period.	Total amount of dry matter in Milk consumed during period.	Nutritive Ratio of Food.	Weight of animal at beginning of period.	Weight of animal at end of period.	Gain in weight per day during period.	
1884.								***Lb.***	***Oz.***
Nov. 5 to Dec. 9.	13.5	109	11.9	24.7	1:2.7	18.5	48.5	0	14
1885.									
Dec. 9 " Jan. 15.	51.0	204	44.5	46.3	1:3.1	48.5	98.5	1	6
Jan. 15 " Feb. 17.	88.0	266	76.6	60.3	1:3.9	98.5	152.0	1	10
Feb. 17 " Mar. 25.	209.0	252	182.5	57.2	1:5.	152.0	209.0	1	9

Total amount of feed consumed from Nov. 5, 1884 to March 25, 1885.

361.5 lbs. Corn Meal, equal to Dry Matter,	315.5 lbs.
831 qts. Skim Milk, " " " "	188.5 "
Total amount of Dry Matter,	504.0 "

Live weight at beginning of experiment,	18.5 lbs.
Live weight at time of killing,	209.0 "
Live weight gained during experiment,	190.5 "
Dressed weight at time of killing,	168.5 "
Loss in weight by dressing, 40.5 lbs., or 19.4 per cent.	
Dressed weight gained during experiment,	154.0 "

Cost of feed consumed during experiment.

361.5 lbs. Corn Meal, at $22.50 per ton,	$4.07
208 gals. Skim Milk, at 1.8c. per gal.,	3.74
	$7.81

2.64 lbs. of dry matter yielded one pound of live weight; and 3.27 lbs. of dry matter yielded one pound of dressed weight.

Cost of feed for production of 1 lb. of dressed pork, 5.07 cents.

B. SKIM MILK AND CORN MEAL.

NUMBER ELEVEN.

PERIODS.	Total amount of Meal consumed during period, (in lbs.)	Total amount of Milk consumed during period, (in quarts.)	Total amount of dry matter in Meal consumed during period.	Total amount of dry matter in Milk consumed during period.	Nutritive Ratio of Food.	Weight of animal at beginning of period.	Weight of animal at end of period.	Gain in weight per day during period.	
1884.								*Lb.*	*Oz.*
Nov. 5 to Dec. 9.	13.5	109	11.9	24.7	1: 2.7	17.0	45.5	0	13
1885.									
Dec. 9 " Jan. 15.	51.0	204	44.5	46.3	1: 3.1	45.5	89.5	1	3
Jan. 15 " Feb. 17.	88.0	266	76.6	60.3	1: 3.9	89.5	138.0	1	7
Feb. 17 " Mar. 25.	209.0	252	182 5	27.2	1: 5.	138.0	191.0	1	8

Total amount of feed consumed from Nov. 5, 1884 to March 25, 1885.

361.5 lbs. Corn Meal, equal to Dry Matter,	315.5 lbs.
831 qts. Skim Milk, " " " "	188.5 "
Total amount of Dry Matter,	504.0 "

Live weight at beginning of experiment,	17.0 lbs.
Live weight at time of killing,	191.0 "
Live weight gained during experiment,	174.0 "
Dressed weight at time of killing,	158.5 "
Loss in weight by dressing, 32.5 lbs., or 17 per cent.	
Dressed weight gained during experiment,	144.5 ".

Cost of feed consumed during experiment.

361.5 lbs. Corn Meal, at $22.50 per ton,	$4.07
208 gals. Skim Milk, at 1.8c. per gal.,	3.74
	$7.81

2.89 lbs. of dry matter yielded one pound of live weight; and 3.48 lbs. of dry matter yielded one pound of dressed weight.

Cost of feed for production of 1 lb. of dressed pork, 5.4 cents.

B SKIM MILK AND CORN MEAL.

NUMBER TWELVE.

PERIODS.	Total amount of Meal consumed during period, (in lbs.)	Total amount of Milk consumed during period, (in quarts.	Total amount of dry matter in Meal consumed during period.	Total amount of dry matter in Milk consumed during period.	Nutritive Ratio of Food.	Weight of animal at beginning of period.	Weight of animal at end of period.	Gain in weight per day during period.	
1884.								***Lb.***	***Oz.***
Nov. 5 to Dec. 9.	13.5	109	11.9	24.7	1:2.7	18.0	48.0	0	14
1885.									
Dec. 9 " Jan. 15.	51.0	204	44.5	46 3	1:3.1	48.0	97.5	1	5
Jan. 15 " Feb. 17.	88.0	266	76.6	60.3	1:3.9	97.5	147.5	1	8
Feb. 17 " Mar. 25.	209.0	252	182.5	57.2	1:5	147.5	216.0	1	14

Total amount of feed consumed from Nov. 5, 1884 to March 25, 1885.

361.5 lbs. Corn Meal, equal to Dry Matter,	315.5 lbs.
831 qts. Skim Milk, " " " "	188.5 "
Total amount of Dry Matter,	504.0 "
Live weight at beginning of experiment,	18.0 lbs.
Live weight at time of killing,	216.0 "
Live weight gained during experiment,	198.0 "
Dressed weight at time of killing,	173.0 "
Loss in weight by dressing, 43 lbs., or 19.88 per cent.	
Dressed weight gained during experiment,	169.5 "

Cost of feed consumed during experiment.

361.5 lbs. Corn Meal, at $22.50 per ton,	$4.07
208 gals. Skim Milk, at 1.8c. per gal.,	3.74
	$7.81

2.55 lbs. of dry matter yielded one pound of live weight; and 2.97 lbs. of dry matter yielded one pound of dressed weight.

Cost of feed for production of 1 lb. of dressed pork, 4.61 cents.

SUMMARY OF RESULTS OF EXPERIMENTS.

A. Pigs fed with *Buttermilk* and *Corn Meal.*

	Corn Meal, in lbs.	***Buttermilk, in gallons.***	***Live Weight, gained during Experiment.***	***Dres'd W'ht gained dur'g Experiment.***	***Cost per pound of Dressed Pork, cts.***
I.	399.	346.	188.5	159.0	5.81
II.	399.	346.	201.0	168.0	5.56
III.	399.	346.	180.5	151.0	6.10
IV.	338.	287.	146.0	118.0	6.55
V.	338.	287.	179.0	146.0	5.29
VI.	338.	287.	183.5	147.5	5.24
	2211.	1899	1078.5	889.5	

B. Pigs fed with *Skim Milk* and *Corn Meal.*

	Corn Meal in lbs.	*Skim Milk in gallons.*	*Live Weight gained during Experiment.*	*Dres'd W'ht gained during Experiment.*	*Cost per pound of Dressed Pork, cts.*
VII.	388.5	303.	217.0	178.0	5.24
VIII.	388.5	303.	201.5	170.0	5.48
IX.	388.5	303.	209.0	174.5	5.35
X.	361.5	208.	190.5	154.0	5.07
XI.	361.5	208.	174.0	144.5	5.40
XII.	361.5	208.	198.0	169.5	4.61
	2250.0	1533.	1190.0	990.5	

Total Cost of Feed Consumed during the Experiment.

A.	2,211 lbs. Corn Meal,	$24.98
	1,899 gallons Buttermilk,	26.02
		$51.00
B.	2,250 lbs. Corn Meal,	$25.42
	1,533 gallons Skim Milk,	27.60
		$53.02

Cost of Feed per Pound of Dressed Pork.

A.	Buttermilk and Meal,	5.73 cts.
B.	Skim Milk and Meal,	5.35 cts.

The pound of dressed pork was sold at 6¾ cts. per pound.

The analyses of Buttermilk from the Creamery, as well as of the Skim Milk from the farm, have been published in BULLETIN No. 17.

The Buttermilk contained 8 per cent. of solids; one quart of it weighed 34.5 ounces, and contained 2.76 ounces of dry matter; one gallon contained 11.04 ounces of solids. The Skim Milk contained 10.22 per cent of solids; one quart of it weighed 35.5 ounces, and contained 3.63 ounces of solids; one gallon contained 14.52 ounces of dry organic matter.

FODDER ANALYSES.

349. CORN MEAL.

The subsequent analysis represents the average of the composition of the corn meal fed during the previously described feeding experiments with pigs.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	12.62	252.40			
Dry Matter,	87.38	1747.60			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	1.56	31.20			1 : 8.76
" Cellulose,	2.66	53.20	18.09	34	
" Fat,	4.27	85.40	64.90	76	
" Protein, (nitrogenous matter),	11.43	228.60	194.31	85	
Non-nitrogenous extract matter,	80.08	1601.60	1505.50	94	
	100.00	2000.00	1782.80		

350. HAY OF OATS.

The crop was cut with the seeds in the milk, July 9th, 1885.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.,	9.55	191.00			
Dry Matter,	90.45	1809.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash,	6.08	121.60			1 : 7.91
" Cellulose,	34.32	686.40			
" Fat,	2.69	53.80	24.75	46	
" Protein, (nitrogenous matter),	10.89	217.80	124.15	57	
Non-nitrogenous extract matter,	46.02	920.40	920.40	100	
	100.00	2000.00	1079.30		

Some of the green crop was used in a feeding experiment with milch cows, previous to the time of cutting for hay.

351. HAY OF BARLEY.

The barley was cut July 9th, 1885, while the seeds were in the milk.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	10.25	205.00			
Dry Matter, ...	89.75	1795.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	4.95	99.00			1 : 9.59
" Cellulose, ...	29.12	582.40			
" Fat, ...	2.76	55.20	25.39	46	
" Protein, (nitrogenous matter),	10.26	205.20	116.96	57	
Non-nitrogenous extract matter, . .	52.91	1058.20	1058.20	100	
	100.00	2000.00	1200.55		

Part of the crop was fed green in connection with a feeding experiment with milch cows, which will be described at a later date.

FERTILIZER ANALYSES.

352. DARLING'S ANIMAL FERTILIZER.

(Collected of W. S. Westcott, Amherst, Mass.)

Guaranteed composition: Ammonia, 4 to 6 per cent. (equivalent to nitrogen 3⅓ to 5 per cent.); phosphoric acid, 10 to 12 per cent.; potassium oxide, 4 to 6 per cent.

	Per Cent.
Moisture at 100° C,	14.93
Total phosphoric acid,	10.52
Soluble " "	0.20
Reverted " "	4.40
Insoluble, " "	5.92
Potassium oxide,	4.91
Nitrogen,	4.36
Insoluble matter,	1.66
Valuation per 2000 lbs.,	$32.01

Correction.—The above results represent the composition of the article No. 345, reported in the previous Bulletin. By some oversight a wrong analysis was published on that occasion.

353. MURIATE OF POTASH.

Sent on for examination by Bolton Farmers and Mechanics Association, Bolton, Mass.

Moisture at 100° C,	0.63	per cent.
Potassium Oxide,	51.33	"
Valuation per ton at current rates,	$43.63	

354. DISSOLVED BONEBLACK.

Sent on for examination by Bolton Farmers and Mechanics Association, Bolton, Mass.

Moisture at 100° C,	10.05
Total Phosphoric Acid,	17.56
Soluble, " "	16.84
Reverted, " "	0.44
Insoluble, " "	0.28
Insoluble Matter,	1.08
Valuation at current rates, per ton,	$31.24

355. DRIED BLOOD.

Sent on for examination by Bolton Farmers and Mechanics Association, Bolton, Mass.

Moisture at 100° C,	7.65	per cent.
Nitrogen,	8.10	"
Phosphoric Acid,	6.23	"
Insoluble Matter,	1.08	"
Valuation at current rates, per ton,	$36.64	

356. NITRATE OF SODA.

Sent on for examination by Bolton Farmers and Mechanics Association, Bolton, Mass.

Moisture at 100° C,	0.85	per cent.
Nitrogen,	16.26	"
Valuation at current rates, per ton,	$58.54	

357. AMMONIUM SULPHATE.

Sent on for examination by Bolton Farmers and Mechanics Association, Bolton, Mass.

Moisture at 100° C,	0.25
Nitrogen,	21.28
Valuation at current rates, per ton,	$76.60

358. CANADA ASHES.

1. Collected of Wm. H. Earle & Co., Worcester, Mass.

2. Munroe, Judson & Stroup; collected of Albert Montague, South Deerfield, Mass.

3. Munroe, Judson & Stroup; collected of E. M. Rouche, South Deerfield, Mass.

	1.	*2.*	*3.*
	Pounds per Hundred.		
Moisture at 100° C,	3.30	11.25	13.33
Total phosphoric acid,	2.30	1.09	1.28
Potassium oxide,	8.51	6.36	5.91
Calcium oxide,	37.49	37.62	39.21
Magnesium oxide,	3.93	7.47	5.11
Insoluble matter,	11.60	6.37	9.36

Sample 1 sold at $14.25 per ton; counting 45 lbs. the weight of a bushel, at 33 cents per bushel. Samples 2 and 3 sold at 25 cents per bushel of from 45 to 48 lbs. each.

C. A. GOESSMANN, Director,
Amherst, Mass.

The Bulletin and I. and II. Annual Reports of the Experiment Station will be sent, free of charge, to all parties interested in its work, on application. Address State Agricultural Experiment Station, Amherst, Mass.

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BULLETIN No. 19.

APRIL, 1886.

The publication of BULLETINS for the present year begins with this number. Copies will be sent to all parties already on our distributing list—without awaiting a special notice. Provisions are made to meet new applications. The supply of BULLETINS No. 1 to 15, and of the second annual report is exhausted, while of BULLETINS Nos. 16, 17 and 18, and of the first annual report there are still a limited number on hand for distribution.

Arrangements are made to attend to the examination of objects of general interest to the farming community, to the full extent of existing resources. Requests for analyses of substances—as fodder articles, fertilizers, etc.—coming through officers of agricultural societies and farmers' clubs within the state, will receive hereafter, as in the past, first attention, and in the order that the applications arrive at the office of the Station. The results will be returned without a charge for the services rendered. Application of private parties for analyses of substances, free of charge, will receive a careful consideration, whenever the results promise to be of a more general interest. For obvious reasons no work can be carried on at the Station, of which the results are not at the disposal of the managers for publication, if deemed advisable in the interest of the citizens of the state.

All parcels and communications sent on to "The Experiment Station" must have express and postal charges prepaid, to receive attention.

Meteorological Summary for three months ending March 31, 1886.

	JANUARY.	FEBRUARY.	MARCH.
Highest temperature,	56.0°	52.0°	61.0°
Lowest temperature,	—22.0°	—11.0°	—1.0°
Mean temperature,	21.9°	23.1°	33.5°
Total Precipitation,	5.39 in.	3.94 in.	3.31 in.
Total snow fall,	11.5 in.	3.0 in.	8.5 in.
Prevailing winds,	Northerly.	Northwesterly.	Northwesterly.
No. of days on which cloudiness averaged 8 or more on scale of 10,	11	6	11
No. of days on which .01 inch or more of rain or melted snow fell,	8	8	7

The temperatures of the given months were close to the averages of previous years but the range was unusually great. The precipitation for January was above the average, but the snow fall has been light. At the close of the period the ground is without snow and in many places free of frost: a condition in advance of average years.

VALUATION OF FERTILIZERS

AND

ANALYSES OF FERTILIZERS.

The valuation of a fertilizer is based on the average trade value of the fertilizing elements specified by analysis. The money value of the higher grades of agricultural chemicals and of the higher priced compound fertilizers, depends in the majority of cases *on the amount* and the *particular form* of *two* or *three essential articles* of *plant food*, i. e., phosphoric acid, nitrogen and potash, which they contain. The valuation which usually accompanies the analyses of these goods shall inform the consumer, as far as practicable, regarding the cash-retail price at which the several specified essential elements of plant food, in an efficient form, have been offered of late for sale, in our large markets.

The market value of low priced materials used for manurial purposes, as salt, ashes, various kinds of lime, barnyard manure, factory refuse and waste materials of different description, does, quite frequently, not stand in a close relation to their chemical composition. Their cost varies in different localities. Local facilities for cheap transportation and more or less advantageous mechanical condition for a speedy action, exert, as a rule, a decided influence on their selling-price.

The wholesale market price of manurial substances is liable to serious fluctations; for supply and demand exert here, as well as in other branches of commercial industry, a controlling influence on their temporary money value. As farmers have only in exceptional instances, a desirable chance to inform themselves regarding the conditions which control the market price, the assistance rendered in this direction, by Agricultural chemists charged with the examination of commercial fertilizers, cannot otherwise but benefit, ultimately both farmers and manufacturers.

The market reports of centres of trade in New England, New York and New Jersey, aside from consultations with leading manufacturers of fertilizers furnish us the necessary information regarding the current trade value of fertilizing ingredients. The subsequent statement of cash-values in the retail trade is obtained by taking the average of the wholesale quotations in New York and Boston, during the six months preceding March 1, 1886, and increasing them by 20 per cent., to cover expenses for sales, credits, etc.

These trade values, except those for phosphoric acid, soluble in ammonium-citrate, were agreed upon by the Experiment Stations of Massachusetts, Connecticut and New Jersey for use in their several states for the present season.

TRADE VALUES OF FERTILIZING INGREDIENTS IN RAW MATERIALS AND CHEMICALS.

	Cents per Pound. *1886.*
Nitrogen in Ammonia salts,	18½
" " Nitrates,	18½
" " Dried and fine ground fish,	17
Organic nitrogen in guano and fine ground blood and meat,	17
Organic nitrogen in cotton seed, linseed meal, and in castor pomace,	17

Organic nitrogen in fine ground bone,	17
“ “ “ medium bone,	15
“ “ in medium bone,	13
“ “ in coarse medium bone,	11
“ “ in coarse bone, horn shavings, hair and fish scraps,	9
Phosphoric acid soluble in water,	8
“ “ “ ammonia citrate,*	7½
“ “ insoluble, in dry fine ground fish, and in fine bone,	7
Phosphoric acid insoluble in fine medium bone,	6
“ “ “ in medium bone,	5
“ “ “ in coarse medium bone,	4
“ “ “ in coarse bone,	3
“ “ “ in fine ground rock phosphate,	2
Potash as high grade sulphate,	5½
“ “ Kainite,	4¼
“ “ Muriate,	4¼

The above trade values are the figures at which on March 1st, the respective ingredients could be bought at retail *for cash* per pound in our leading markets in the *raw materials*, which are the regular source of supply.

They also correspond to the average wholesale prices for the six months ending March 1st, plus 20 per cent. in case of goods for which we have wholesale quotations. The calculated values obtained by the use of the above figures will be found to agree fairly with the reasonable retail price in case of standard raw materials such as:

Sulphate of Ammonia,
Nitrate of Soda,
Muriate of Potash,
Sulphate of Potash,
Dried Blood,
Dry Ground Fish,
Castor Pomace,
Cotton Seed,
Bone,
Azotin,
Plain Superphosphates.

TRADE VALUES IN SUPERPHOSPHATES, SPECIAL MANURES AND MIXED FERTILIZERS OF HIGH GRADE.

The organic nitrogen in these classes of goods will be valued at the highest figure laid down in the Trade Values of Fertilizing Ingredients in Raw Materials, namely seventeen cents per pound, it being assumed that the organic nitrogen is derived from the best sources, viz.: bone, blood, animal matter, or other equally good forms and not from leather, shoddy, hair or any low-priced inferior form of vegetable matter, unless the contrary is ascertained.

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*Dissolved from two grams of Phosphate unground, by 100 C. C. neutral solution of ammonium citrate, sp. gr. 1.09 in 30 minutes at 65 deg. C., with agitation once in five minutes; commonly called “reverted” or “backgone” phosphoric acid.

Insoluble Phosphoric acid will be valued at 3 cents, it being assumed, unless found otherwise, that it is from bone or similar source and not from rock phosphate. In this latter form the insoluble phosphoric acid is worth but 2 cents per pound. Potash is rated at 4¼ cents, if sufficient chlorine is present in the fertilizer to combine with it to make muriate. If there is more Potash present than will combine with the chlorine, then this excess of Potash will be counted as sulphate. To introduce large quantities of chlorides, common salt, etc., into fertilizer, claiming sulphate of potash as a constituent, is a practice, which in our present state of information will be considered of doubtful merit. The use of the highest trade values is but justice to these articles in which the costliest materials are expected to be used.

In most cases the valuation of the ingredients in Superphosphates and Specials falls below the retail price of these goods. The difference between the two figures, represents the manufacturer's charges for converting raw materials into manufactured articles. These charges are for grinding and mixing, bagging or barreling, storage and transportation, commission to agents and dealers, long credits, interest on investment, bad debts, and finally profits.

The prices stated in these bulletins in connection with analyses of commercial fertilizers refer to their cost per ton of 2,000 pounds, on board of car or boat near the factory, or place for general distribution. *To obtain the Valuation of a Fertilizer* (i. e. the money-worth of its fertilizing ingredients), we multiply the pounds per ton of Nitrogen, etc., by the trade-value per pound. We thus get the values per ton of the several ingredients, and adding them together we obtain the total valuation per ton.

The *mechanical condition* of any fertilizing material, simple or compound, deserves the most serious consideration of farmers, when articles of a similar chemical character are offered for their choice. The degree of pulverization controls, almost without exception, under similar conditions, the rate of solubility, and the more or less rapid diffusion of the different articles of plant-food throughout the soil.

The *state of moisture* exerts a no less important influence on the pecuniary value, in case of one and the same kind of substance.

Two samples of fish fertilizer, although equally pure, may differ from 50 to 100 per cent. in commercial value, on account of mere difference in moisture.

Crude stock for the manufacture of fertilizers, and *refuse material* of various descriptions, sent to the Station for examination, are valued with reference to the market prices of their principal constituents, taking into consideration at the same time their general fitness for speedy action.

A large percentage of commercial fertilizing material consists of refuse matter from various industries. The composition of these substances depends on the mode of manufacture carried on. The rapid progress in our manufacturing industry is liable to affect at any time, more or less seriously, the composition of the refuse. A constant inquiry into the character of the *agricultural chemicals*, and of *commercial manurial refuse substances* offered for sale, cannot fail to secure confidence in their composition, and to diminish financial disappointment in consequence of their application. This work is carried on for the purpose of aiding the farming community in a clear and intelligent appreciation of the substances for manurial purposes.

Consumers of commercial manurial substances do well to buy whenever practicable, on a guaranty of composition with reference to their *essential constituents*; and to see to it that the bill of sale recognizes that point of the bargain. Any mistake or misunderstanding in the transaction may be readily adjusted, in that case, between the contending parties. The responsibility of the dealer ends with furnishing an article, corresponding in its composition with the *lowest* stated quantity, of each specified essential constituent.

359. CANADA WOOD ASHES.

I and II sent on from Concord, Mass.

III and IV sent on from South Deerfield, Mass.

	I.	*II.*	*III.*	*IV.*
		Pounds per hundred.		
Moisture at 100° C.,	17.00	18.15	4.90	2.48
Potassium oxide,	4.28	4.80	7.42	6.53
Calcium oxide,	31.31	30.69	42.10	42.98
Magnesium oxide,	2.36	3.71	3.55	3.66
Phosphoric acid,	3.34	3.26	2.00	1.44
Insoluble matter,	15.50	17.35	7.12	4.87

These samples represent the extremes of composition noticed in our section of the state. The use of Canada ashes has of late steadily increased, and the cost gradually declined to 24 to 25 cents per bushel, of forty-five to fifty pounds. These are prices by the carload at Amherst and in its vicinity.

360. ASH OF COTTON SEED HULLS.

Sent on for examination from Northampton, Mass.

		Per Cent.
Moisture at 100° C.,		2.30
Calcium oxide,		11.63
Magnesium oxide,		15.24
Phosphoric acid,	(at 6 cts. per pound),	13.67
Potassium oxide,	(at 5½ cts. per pound),	30.82
Insoluble matter,		21.65

Valuation per 2000 lbs., $50.30.

The percentage of potassa found in the above sample is exceptionally high; the same may be said of the phosphoric acid. On previous occasions potassium oxide was noticed, in this brand of ashes, as low as 23.72 per cent., and the phosphoric acid, 7.88 per cent. From detailed investigations of the cotton plant by Prof. H. C. White of Georgia, "On the Complete Analysis of the Cotton Plant," 1874, we have learned the general character of the ash constituents of the various parts of the cotton plant.

Judging from his analytical statements it becomes apparent that ashes of the cotton plant sold in our section of the country do not represent the mineral constituents of any particular part of the plant, but are obtained from a mixture of different parts, in varying proportions. Taking this feature of their origin into consideration, it becomes most advisable to buy these valuable ashes only on guaranty of composition.

361. GROUND BONE.

Sent on for examination from Concord, Mass.

	Per Cent.
Moisture at 100° C.,	4.78
Total phosphoric acid,	29.83
Reverted, " "	9.22
Insoluble " "	20.61
Nitrogen,	2.03
Insoluble matter,	0.30

Valuation per 2000 lbs., $34.79.

As the principal part of the article was of a coarse medium quality, insoluble phosphoric acid has been valued four cents per pound and nitrogen eleven cents.

362. BONEBLACK WASTE.

Sent on for examination.

	Per Cent.
Moisture at 100° C.,	10.65
Total phosphoric acid,	29.64
Insoluble matter,	2.80

Valuation per 2000 lbs., $23.71.

This article is best used in the form of a superphosphate, commonly called, dissolved boneblack.

363. FISH WASTE.

Sent on for examination from Boston, Mass.

	Per Cent.
Moisture at 100° C.,	71.11
Nitrogen,	2.21
Phosphoric acid,	0.60
Fat,	0.45

Valuation per 2000 lbs., $4.58

The article consisted of coarse pieces of fish, and its valuation is based for that reason on the rates of cost adopted for coarse fish-scraps: nine cents per pound of nitrogen and five cents per pound of phosphoric acid.

364. FISH AND POTASH.

Sent on for examination.

	Per Cent.
Moisture at 100° C.,	23.58
Total phosphoric acid,	6.26
Soluble " "	3.58
Reverted " "	1.33
Insoluble " "	1.35
Potassium oxide,	3.24
Nitrogen,	3.07
Insoluble matter,	1.90

Valuation per 2000 lbs., $22.00.

365. FLAMINGO GUANO.

Sent on for examination from Worcester, Mass.

	Per Cent.
Moisture at 100° C.,	17.20
Total phosphoric acid,	16.16
Soluble " "	0.48
Reverted " "	5.22
Insoluble " "	10.46
Potassium oxide,	0.31
Nitrogen,	0.80
Insoluble matter,	2.95

Valuation per 2000 lbs., $17.86.

366. GLUCOSE REFUSE.

Sent on for examination.

	Per Cent.
Moisture at 100° C.,	8.10
Dry vegetable matter,	91.80
Nitrogen	2.62
Phosphoric acid	0.29
Magnesium oxide	0.02
Calcium oxide	0.18
Sodium oxide	0.12
Potassium oxide	0.15
Insoluble matter	0.07

Valuation per 2000 lbs., $9.33

This material consists mainly of the skins of corn; it is evidently the insoluble residual matter left behind after the conversion of the starch into glucose syrup. The manurial value of the article rests mainly on the amount of nitrogen it contains in form of insoluble nitrogenous matter. To render it an efficient manure requires in the majority of cases a liberal addition of phosphoric acid and potash.

367. ROTTEN BREWER'S GRAIN.

Sent on for examination from Lawrence, Mass.

	Per Cent.
Moisture at 100° C.,	78.77
Dry vegetable matter,	21.23
Nitrogen	0.72
Calcium oxide	0.26
Magnesium oxide	0.15
Phosphoric acid	0.43
Potassium oxide	0.04
Insoluble matter	0.59

Valuation per 2000 lbs., $2.91.

The general character of the above mentioned substance resembles that of barnyard manure. It contains more nitrogen and phosphoric acid, and less potash than the average barnyard manure. By increasing the latter ingredient to one-half a per cent. a fair substitute for barnyard manure may be obtained.

368. HOP REFUSE.

Sent on for examination from Lawrence, Mass.

	Per Cent.
Moisture at 100° C.,	80.98
Dry vegetable matter,	19.02
Nitrogen	0.98
Calcium oxide	0.27
Magnesium oxide	0.10
Phosphoric acid	0.20
Potassium oxide	0.11
Insoluble matter	0.63
Valuation per 2000 lbs.,	$3.62

This refuse from breweries differs from the previously described one merely by a larger percentage of nitrogen, it contains. Supplemented by some phosphoric acid and potash it may serve in place of barnyard manure. The average barnyard manure (partly rotten) is usually stated to contain 0.5 per cent of nitrogen, 0.26 per cent. of phosphoric acid and 0.6 per cent of potassium oxide.

ANALYSES OF VARIOUS ARTICLES OF FEED WITH REFERENCE TO FERTILIZING CONSTITUENTS.

369. 1. *Ground Corn and Oats.*

	Per cent.
Moisture at 100° C.,	10.48
Phosphoric acid,	0.78
Magnesium oxide,	0.05
Calcium oxide,	0.18
Sodium oxide,	0.22
Potassium oxide,	0.37
Nitrogen,	2.10
Insoluble matter,	0.29
Valuation per 2000 lbs.,	$8.23

The mixture consisted of equal weight parts of the grains.

370. *2. Wheat Bran.*

	Per cent.	
Moisture at 100° C.,	11.45	9.40
Phosphoric acid,	3.05	3.12
Magnesium oxide,	0.90	0.91
Sodium oxide,	0.09	0.16
Potassium oxide,	1.49	1.42
Nitrogen,	2.82	3.08
Insoluble matter,	0.11	0.15
Valuation per 2000 lbs.,	$13.91	$14.80

The above analyses refer to the quality of bran fed of late at the station.

371—372. *3. Globe Mangold.*

4. Vilmorin Sugar Beet.

	3	4
	Pounds per hundred.	
Moisture at 100° C.,	85.99	88.27
Dry matter,	14.01	11.73
Nitrogen,	2.52	2.05
Crude ash,	8.00	4.45
Potassium oxide,	3.79	1.29
Sodium oxide,	2.55	1.26
Calcium oxide,	0.24	0.42
Magnesium oxide,	0.32	0.25
Phosphoric acid,	0.20	0.23
Ferric oxide,	0.03	0.07
Insoluble matter,	0.74	0.68
Valuation per 2000 lbs.,	$12.03	$8.35

RELATIVE PERCENTAGE OF SOLUBLE ESSENTIAL CONSTITUENTS IN ONE HUNDRED PARTS OF THE ASH (3—4).

	3	4
Potassium oxide,	53.156	36.648
Sodium oxide,	35.764	35.795
Calcium oxide,	3.366	11.932
Magnesium oxide,	4.488	7.103
Phosphoric acid,	2.805	6.534
Ferric oxide,	0.421	1.988
	100.000	100.000

373—374. *Whole Apples.*

5. Rhode Island Greening.
6. Sweet Apple.

	5	6
	Pounds per	*hundred.*
Moisture at 100o C.,	84.650	——
Dry matter,	15.350	——
Nitrogen,	0.730	0.630
Crude ash,	2.130	2.020
Potassium oxide,	0.796	1.086
Sodium oxide,	0.086	0.171
Calcium oxide,	0.152	0.180
Magnesium oxide,	0.162	0.116
Ferric oxide,	0.011	0.019
Phosphoric acid,	0.053	0.046
Insoluble matter,	0.015	0.017
Valuation per 2000 lbs.,	$3.22	$3.12

375—376. *Apple Pomaces.*

7. Rhode Island Greening.
8. Baldwin Apple.

	7.	8.
	Pounds per	*hundred.*
Moisture at 100o C.,	78.220	82.780
Dry matter,	21.780	17.220
Nitrogen,	1.110	1.240
Crude ash,	1.090	1.780
Potassium oxide,	0.548	0.875
Sodium oxide,	0.151	0.121
Calcium oxide,	0.194	0.189
Magnesium oxide,	0.128	0.164
Ferric oxide,	0.039	0.049
Phosphoric acid,	0.081	0.107
Insoluble matter,	0.041	0.050
Valuation per 2000 lbs.,	$4.34	$5.09

The composition of the apples, which served for the above analyses, has been described in the third annual report of the institution, recently sent out.

C. A. GOESSMANN, *Director*,

AMHERST, MASS.

The Bulletin of the Experiment Station will be sent free of charge to all parties interested in its work, on application.

J. E. Williams, Printer, Amherst, Mass.

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AGRICULTURAL EXPERIMENT STATION.

BULLETIN No. 20.

MAY, 1886.

Meteorlogical Summary for two months ending May 31st, 1886.

	APRIL.	MAY.
Highest temperature,	83.0°	82.0°
Lowest temperature,	21.0	29.0
Mean temperature,	50.4	57.3
Total precipitation,	1.73 in.	3.10 in.
Prevailing winds,	S. W. to N. W.	S. E. to S. W.
No. of days on which cloudiness averaged 8 or more on scale of 10,	10	12
No. of days on which .01 inches or more of rain or melted snow fell,	6	7

The season at the close of the month of April, as indicated by the state of vegetation, was fully two weeks in advance of the average. The month of May was cool throughout, and the general farm crops (except grass) were at its close no farther advanced than for the average of years at the same period.

FODDER AND FODDER ANALYSES.

The application of an intelligently devised system of chemical tests for the purpose of ascertaining the amount, and, the relative proportion of the essential proximate constituents of our fodder articles, has rendered valuable services to practical agriculture. The chemical analysis of plants during their successive stages of growth has shown marked alterations in their composition as far as the absolute amount of vegetable matter as well as the relative proportion of the essential plant-constituents are concerned. It has rendered not less conspicuous the important influence which the soil in its varying state of fertility exerts on the *quantity* and the *quality* of the growth raised upon it. The lessons derived from this source of information have stimulated inquiries concerning the safest modes of manuring, of cultivating, and of harvesting our different farm crops with the prospect of securing the most satisfactory returns under existing circumstances.

A better knowledge regarding the particular quality of the various articles of fodder at our disposal improves our chances of supplementing them judiciously and thus economically, for different kinds of farm live stock, as well as for different conditions and functions of the same kind. It furnishes, also, a safer basis for the explanation of the results obtained in actual feeding experiments. To study the nutritive value or feeding effect of any of our fodder articles by actual feeding experiments without learning, as far as practicable, something more definite regarding its particular quality, or composition, deprives the results obtained largely of their general interest, for they are secured under ill-defined circumstances. The chemical analysis of an article of fodder is for these reasons considered the first step required to render an intelligent interpretation of the results in feeding trials possible. Actual feeding experiments have shown that *three groups* of *plant constituents*, namely, *nitrogenous*, *non-nitrogenous*, and *mineral constituents*, are *needed* to sustain successfully animal life. No one or two of them, alone, can support it for any length of time. In case the food does not contain *digestible* non-nitrogenous substances, the fat and a portion of the muscles of the animal on trial will be consumed in the support of respiration before its life terminates. In case digestible nitrogenous constituents are excluded from the diet, the formation of new blood and flesh from the food consumed ceases, for the animal system, according to our present state of information, is not capable of producing its principal constituents from anything else than the nitrogenous constituents of the plants.

Herbivorous animals receive these substances directly from the plants; carnivorous animals indirectly, by feeding on herbivorous animals. We feed, at present, our farm stock too frequently without a due consideration of the general natural law of nutrition; to deal out our fodder crops only with mere reference to name, instead of making ourselves more familiar with their composition and their particular quality, deprives us even of the chance of drawing an intelligent conclusion from our present system of feeding.

To compound the animal diet with reference to the *particular organization* of the *animal*, its *age*, and its *functions*, is of no more importance than to select the fodder substances with reference to its *special wants*, as far as the *absolute* and *relative quantity* of the *three essential groups* of food constituents are concerned.

The peculiar character of our home-raised fodder articles is apt to conceal their special deficiency for the various purposes they are used for in general farm management. They all contain the three essential food constituents, yet in widely varying proportions, and they ought, therefore, to be supplemented in different directions to secure their full economical value. To resort to more or less of the same fodder article to meet the special wants, may meet the case as far as an *efficient* support of the animal is concerned, yet it can only in exceptional cases be considered good economy.

To satisfy the craving of the stomach and to feed a nutritious food are both requirements of a healthy animal diet, which, each in its own way, may be complied with. The commercial fodder substances, as oil cakes, meal refuse, brans, and our steadily increasing supply of refuse material from breweries, starch works, glucose factories, etc., are admirably fitted to supplement our farm resources for stock-feeding; they can serve in regard to animal growth, and support, in a similar way as the commercial fertilizer in the growth of farm crops, by supplementing our home manurial resources. To feed an excess of fodder materials, as roots, potatoes, etc., which contain a large proportion of *non-nitrogenous* substances, as starch, sugar, digestible cellular substance, etc., means direct waste, for they are ejected by the animal, and do not even materially benefit the manure heap. In case of an excessive consumption of *nitrogenous* constituents, a part of the expense is saved in an increased value of the manure, yet scarcely enough to recommend that practice beyond merely exceptional cases. The aim, therefore, of an economical stock-feeding must be to compound our various fodder materials in such a manner that the largest quantity of each of the three groups of fodder substances which the animal is capable of assimilating, should be contained in its daily diet to meet the purpose for which it is kept.

To compound the fodder rations of our farm stock with reference to the special wants of each class of them, is an essential requirement for a satisfactory performance of their functions; to supply these wants in an economical way controls the financial success of the industry. From these and similar considerations it will be apparent that the development of a more rational, and thus more economical, system of feeding farm live stock, requires the following kind of information:—

First. How much of each of the essential groups of food-constituents are contained in the fodder we feed?

Second. How much of each of these essential food-constituents are digestible under existing circumstances, and thus directly available to the particular animal on trial?

Third. How much of each of the three essential food-constituents does each kind of animal require to secure the best results?

More than twenty-five years have passed by since these questions have engaged the attention of skillful experimenters. Sufficient valuable information has been secured in the course of time to encourage the use of the adopted methods of observation, and to impart to many of the conclusions arrived at a just claim for a serious consideration on the part of practical agriculturists. The fact that much needs still to be learned to meet the reasonable expectations of those engaged in the development of a more economical system of feeding farm live stock, cannot be considered a valid reason why we should not make intelligent use of what we have learned.

The *chemical analysis of a fodder article is* carried on with a view to determine the quantity of *each group* of *its constituents*, which is considered an *essential* ingredient of a complete food for the support of animal life. Our modes of analyzing articles of fodder are practically the same, wherever this work is carried out intelligently. The results obtained are, therefore, applicable for the determination of a *comparative* value wherever the *identity* of the material can be established.

The actual results of the analysis are usually reported under the following headings:—

1. Amount of moisture lost at 110° C., or 230° F., and amount of dry matter left behind.
2. Amount of mineral matter left behind after a careful incineration of the material.
3. Amount of organic nitrogenous matter—commonly called crude protein.
4. Amount of non-nitrogenous organic matter,—exclusive of fat, and of coarse cellulose substances.

The entire mass which any fodder substance leaves behind after being heated at one hundred and ten degrees, Centigrade temperature, is called *dry matter*. An increase in dry substance in case of any plant or part of plant at the same stage of growth, indicates usually a higher feeding value. To satisfy the craving of the animal, a certain quantity or bulk of coarse, dry matter becomes an important consideration in making up the fodder rations for different classes of animals. In raising young stock for fattening purposes, a liberal supply is also desirable, to effect a proper distention of the digestive organs, to make them good feeders hereafter.

Nitrogenous substances or *protein matter* refer to several groups of nitrogen-containing compounds, of plants in particular, (albumen, fibrin, casein,) which are essential for the formation of blood and tissues. Those contained in animal matter, as meat refuse, are frequently considered of a higher value than those in many plants.

Non-nitrogenous substances include, in particular, starch, sugars, organic acids, gums, fats, and the digestible portion of the cellular matter of the fodder. These substances are readily transformed, within the digestive organs, into soluble compounds of a similar chemical character, and are thus assumed to serve an identical physiological purpose. As more recent investigations have shown a superior physiological value of the fat,—one of the non-nitrogenous constituents,—2½ times as much, as compared with starch, sugar, and other representatives of that group, its amount is separately recorded. The same course, for similar reasons, has been of late adopted with reference to certain forms of nitrogenous organic constituents of fodder articles.

Fatty substances include all the various natural fats of the plant. Most plants contain more than was assumed at an earlier stage of inquiry. As the fat is separated by means of ether, the statements in the analyses do not exactly express the amount of fatty matter alone, but include more or less wax, resinous substances, etc., which are largely soluble in ether, and of a similar highly carbonaceous character. The fat of the fodder seems to serve, in case of judicious fodder rations, mainly to increase the stock of fat in the animal which consumes the fodder.

Wherever the article has been tested by actual feeding experiment under skillful observation, the *amount of each essential group* of food constituents, which has been shown to be *digestible*, is reported in connection with the chemical analysis, under the heading—*Digestible Portion*—per hundred weight or per ton. The *higher* or *lower degree* of *digestibility* of a fodder article exerts a *decided* influence on its nutritive value. Different stages of growth affect the rates of digestibility of the various plant constituents. The same feature is noticed in regard to different parts of plants, as well as in case of different kinds of animals.

More than two hundred fodder articles have thus far been studied under varying circumstances, and most of our current kinds of fodders have been tested, in Europe and elsewhere, in numerous well conducted feeding experiments with a suitable selection of different kinds of farm live stock. This fact imparts to many of the results recorded a sufficient importance to recommend them as a basis of new feeding trials, with feed stuffs raised in our climate or obtained in our home industries.

The last but not least important column of the statement of the chemical analysis—quite frequently found in the general record of a fodder for a practical agricultural purpose—is that of "*Nutritive* Ratio." These words are used to express the numerical relation of its *digestible nitrogenous substances*—taken as one, as compared with the sum of its *digestible non-nitrogenous organic constituents*, fat included. The information derived from that statement is very important; for it means to express the summary of results secured by actual feeding trials under specified conditions, and with the aid of the best indorsed chemical modes to account for the constituents of the food before and after it has served for the support of the animal on trial.

Experience has shown that different kinds of animals, as well as the same kind at different ages and for different functions, require a different proportion of the essential groups of food constituents to produce in each case the best results. A statement of the *nutritive ratio* of a fodder article,—otherwise well adapted as an ingredient of a daily diet in the case under consideration,—indicates the direction in which the material has to be supplemented to economize its several constituents to a full extent.

Practical trials with milch cows have demonstrated that they require for the highest production of a good milk and the maintenance of a healthy live weight, the most nutritious food we are in the habit of giving to full-grown farm animals. Careful examinations into the composition of an efficient diet for milch cows have shown that it contains *one* part of *digestible nitrogenous* matter to from *five* to *five* and a *half* parts of *digestible non-nitrogenous* organic matter. A due consideration of these facts renders it but natural that a good corn ensilage, which has a nutritive ratio of 1. to from 10. to 12., needs a liberal addition of substances like oil-cakes, wheat bran, gluten meal, etc., which have a nutritive ratio of from 1. to from 2.5 to 4., to secure its full value as an ingredient of a daily diet in the dairy; or that good hay shows the beneficial effects of an addition of these valuable waste products. less than that of an inferior quality. The nutritive ratio of hay may vary from 1. to 5.5 to from 1. to 9. or more.

The value of an article of fodder may be stated from two different standpoints,—that is, with reference to its cost in the local market, and with reference to its nutritive value or its feeding effect. The *market price* may be expressed by a definite sum, for each locality; it depends on demand and supply in the market, and it is beyond the control of the individual farmer. The *nutritive value*, or *commonly called food value* of the *article*, cannot be expressed by a definite sum; it varies with a more or less judicious application, and depends also, to a considerable degree, on its adaptation under varying circumstances. To secure the most satisfactory returns, from *feeding* our home-raised fodder crop, is as important a question, as that of *raising* them in an economical manner. The great progress which has been made during the past ten or twelve years in regard to the proper mode of feeding plants ought to serve as an encouragement to undertake the task of inquiring more *systematically* into the proper mode of feeding our farm live stock, in the most profitable way.

The importance of the question under discussion, it is hoped, will serve as an excuse for the somewhat lengthy introduction.

ANALYSES OF FODDER.

377. THE CONCENTRATED FEED.

Sent on by South Deerfield Farmers' Club, South Deerfield, Mass.

97.52 per cent. passed through mesh 144 to the square inch.

	PER CENT.
Moisture at 100° C.	10.65
Crude Ash,	14.48
" Cellulose,	9.31
" Fat,	4.30
" Protein (nitrogenous matter),	13.90
Non-nitrogenous extract matter,	47.36
	100.00

ANALYSIS OF DRY MATTER.

Crude Ash,	16.21
" Cellulose,	10.42
" Fat,	4.81
Protein (nitrogenous matter),	15.56
Non-nitrogenous extract matter,	53.00
	100.00

The material was received in a bag marked "The Concentrated Feed Company, Boston, Mass." A circular collected of the agent at South Deerfield, contains a statement of an analysis of the article, which as far as essential points are concerned, does not materially differ from our own, above reported.

The material was of a good mechanical condition and consisted evidently of a mixture of several ingredients; among them was noticeable common salt. An actual test showed the presence of 7.4 per cent. of chlorine, which indicates the presence of from 11 to 12 per cent. of common salt. On inquiry it was learned that "The Concentrated Feed" sold at $8.00 per one hundred weight, a most remarkable price for an article of fodder without any stated guaranty of its various ingredients, nor any statement of its rate of digestibility under some specified condition. The selling price of the article seems to be based largely on the merits of the invention of the compound. It would be no difficult task to compound from our most reputed concentrated feed stuffs, even without a liberal addition of common salt, an article, which would conform to the composition claimed by the manufacturer of "The Concentrated Feed," and at the same time could be sold with a good compensation to the agent, even in remote localities, at a less price per ton, than "The Concentrated Feed" sells for per five hundred pounds.

From my remarks in previous pages it must be apparent, that a mere analysis of a fodder article without any further reliable information concerning its source and its special character, is no safe basis for a decision regarding its particular value for feeding purposes. The practice of buying *compound* feedstuffs in the general market, without a sufficient *actual* knowledge regarding the kind or the character of its various ingredients, ought to be decidedly discouraged; for the farmer, who pursues that course, leaves his best interest to mere chance. To feed commercial *compound* feedstuffs without *some more positive* knowledge of the article which constitutes them, can impart but little useful information for future operation beyond the lesson, to be less credulous hereafter.

378. WHEAT MIDDLINGS.

Sent on from Bolton, Mass.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C.	10.55	211.00	Not determined by actual feeding tests.	Not determined by actual feeding tests.	
Dry Matter, ...	89.45	1789.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	2.49	49.80			
" Cellulose, ...	1.40	28.00			
" Fat, ...	4.26	85.20			
" Protein (nitrogenous matter), .	19.21	384.20			
Non-nitrogenous extract matter, . .	72.64	1452.80			
	100.00	2000.00			

The composition is very fair, and its mechanical condition was not less satisfactory.

379. WHEAT MIDDLINGS.

Sent on from Barre, Mass.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ... ,	9.85	197.00	Not determined by actual feeding tests.	Not determined by actual feeding tests.	
Dry Matter, ...	90.15	1803.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	2.53	50.60			
" Cellulose, ...	2.75	55.00			
" Fat, ...	3.19	63.80			
" Protein, (nitrogenous matter), .	17.23	344.60			
Non-nitrogenous extract matter, . .	74.30	1486.00			
	100.00	2000.00			

This material contains less fat and nitrogenous matter than the previous one, yet not less than samples from the same mill may show at different times.

380. HOMINY MEAL.

Sent on from Berlin, Mass.

51.64 per cent. passed through mesh 144 to square inch.

	Percentage Composition.	Constituents (in lbs.) in a ton of 2000 lbs.	Pounds digestible in a ton of 2000 lbs.	Per cent. of digestibility of constituents.	Nutritive Ratio.
Moisture at 100° C., ...	10.70	214.00			
Dry Matter, ...	89.30	1786.00			
	100.00	2000.00			
ANALYSIS OF DRY MATTER.					
Crude Ash, ...	2.82	56.40			1 : 8.75
" Cellulose, ...	3.69	73.80	25.09	34	
" Fat, ...	10.88	217.60	165.38	76	
" Protein, (nitrogenous matter), .	11.88	237.60	201.96	85	
Non-nitrogenous extract matter, . .	70.73	1414.60	1329.72	94	
	100.00	2000.00	1722.15		

The composition is that of good article of its kind.

Fertilizers and Fertilizer Analyses.

One point, which deserves the careful consideration of farmers when devising an efficient and economical diet for their live-stock, does not always receive a proper attention, namely, the manurial value of the residue left on their hands when the fodder has served its its legitimate purpose. The financial success of a mixed farm management depends quite often largely on the amount, the character, and the cost of the manure obtained in connection with the special industry. The question whether one or the other fodder mixture has to be considered under existing conditions the most economical one, can only be decided intelligently when *both*, the *original cost* and *the value* of the *manurial matter* obtained by its use, are duly considered. The barnyard manure ought to remain, in a rational farm management, the cheapest manurial resource of the farmer. Objections raised against a liberal use of barnyard manure ought not to rest on its original cost of production, as compared with other manurial resources. Well founded objections occasionally raised in regard to its unrestricted use under exceptional circumstances are based on its peculiar mechanical and chemical character and cost of transportation. The analyses of fodder articles with reference to their fertilizing constituents are published for the purpose of assisting in a correct appreciation of the *relative manurial value* of fodder articles under *similar circumstances.*

ANALYSIS OF VARIOUS ARTICLES OF FEED WITH REFERENCE TO FERTILIZING CONSTITUENTS.

381. 1. WHEAT FEED.

Collected at a mill in Amherst, Mass.

Moisture at 100° C.,	9.18	per cent.
Nitrogen,	2.63	"
Crude Ash,	2.30	"
Magnesium oxide,	0.21	"
Calcium oxide,	0.20	"
Potassium oxide,	0.63	"
Sodium oxide,	0.11	"
Phosphoric acid,	0.95	"

Valuation per 2000 lbs., $10.63

382. 2. WHEAT MEAL.

Collected from a mill in Amherst, Mass.

Moisture at 100° C.,	9.83	per cent.
Nitrogen,	2.21	"
Crude Ash,	1.22	"
Magnesium oxide,	0.05	"
Calcium oxide,	0.17	"
Potassium oxide,	0.54	"
Sodium oxide,	1.06	"
Phosphoric acid,	0.57	"

Valuation per 2000 lbs., $8.65.

383. 3. CORN COBS.

Average result of four current varieties of corn raised in Hampden and Hampshire Counties, Mass.

Moisture at 100° C.,	10.00	per cent.
Nitrogen,	0.54	"
Ash,	1.03	"

Silica,	0.20	"
Ferric oxide,	0.01	"
Calcium oxide,	0.03	"
Magnesium oxide,	0.06	"
Potassium oxide,	0.68	"
Sodium oxide,	0.04	"
Phoshoric acid,	0.08	"

Valuation per 2000 lbs., $2.52.

384-385. 4. GLOBE MANGOLD.

5. VILMORIN SUGAR BEET.

	4.	*5.*
	Pounds per	*hundred.*
Moisture at 100° C.,	88.27	85.99
Dry Matter,	11.73	14.01
Nitrogen,	0.30	0.29
Crude Ash,	0.96	0.62
Potassium oxide,	0.45	0.18
Sodirm oxide,	0.21	0.18
Calcium oxide,	0.03	0.06
Magnesium oxide,	0.04	0.04
Phosphoric acid,	0.02	0.03
Ferric oxide,	0.04	0.01
Insoluble matter,	0.09	0.10
Valuation per 2000 lbs.,	$1.42	$1.18

CORRECTION. In a few *advanced* copies of Bulletin No. 19 the manurial value of a ton of the above roots was stated with reference to the *dried vegetable matter* of each, instead of, as intended, to that of the average root in its natural condition. To prevent misconstruction, the results of our investigation are here republished in the corrected form.

386. 6. DAMAGED COTTON SEED MEAL.

Sent on from Greenfield, Mass.

Moisture at 100° C.,	9.90	per cent.
Total phosporic acid,	1.26	"
Potassium oxide,	1.21	"
Magnesium oxide,	0.56	"
Calcium oxide,	0.22	"
Nitrogen,	3.73	"
Insoluble matter,	0.20	"

Valuation per 2000 lbs., $14.97.

The article was offered at $19.00 per ton of 2000 lbs.

387. ANALYSIS OF HEN MANURE.

Sent on from Townsend, Mass.

Moisture at 100° C.,	8.35	per cent.
Phosphoric acid,	2.02	"
Calcium oxide,	2.22	"
Magnesium oxide,	0.68	"
Potassium oxide,	0.94	"
Nitrogen in organic matter,	1.85	"
Nitrogen in actual ammonia,	0.28	"
Insoluble matter,	34.65	"

Valuation per 2000 lbs., $10.55.

The material was dry and contained the usual admixture of feathers, short pieces of coarse vegetable matter, earthy substances, etc., yet not in an extraordinary degree. The value of the hen manure depends not less on the care which is bestowed on its keeping, than on the kind of food the fowls consume. The excretion of birds, on account of their peculiar character, undergoes a rapid change; a large amount of ammonia is soon formed, which reduces materially its manurial value, in case it is allowed to escape. A liberal use of plaster, of kieserite, or of good loam is highly recommendable for the absorption of the ammonia. The safest way to secure the full benefit of the droppings is to gather them quite frequently, and to add directly any of the previously mentioned materials. A sandy soil is of little use as an absorbent.

388. ASHES OF CHESTNUT RAILROAD TIES.

Sent on from Waltam, Mass.

Moisture at 100° C.,	6.15	per cent.
Calcium oxide,	4.71	"
Magnesium oxide,	1.80	"
Potassium oxide,	0.19	"
Phosporic acid,	1.54	"
Insoluble mineral matter,	77.83	"

The material was of a dark brown color, and evidently not the pure ash, for it contained 77.83 per cent. of worthless earthy matter. The ash in the *above described state* does not pay carrying any considable distance; it is worth much less than leached ashes.

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The Bulletin of the Experiment Station will be sent free of charge to all parties interested in its work, on application.